Sept. 11, 1951 P. DE ANGUERA 2,567,191

PIN INSERTING MACHINE FOR MAKING A STRUCTURAL UNIT

Filed Nov. 1, 1946 6 Sheets-Sheet 1

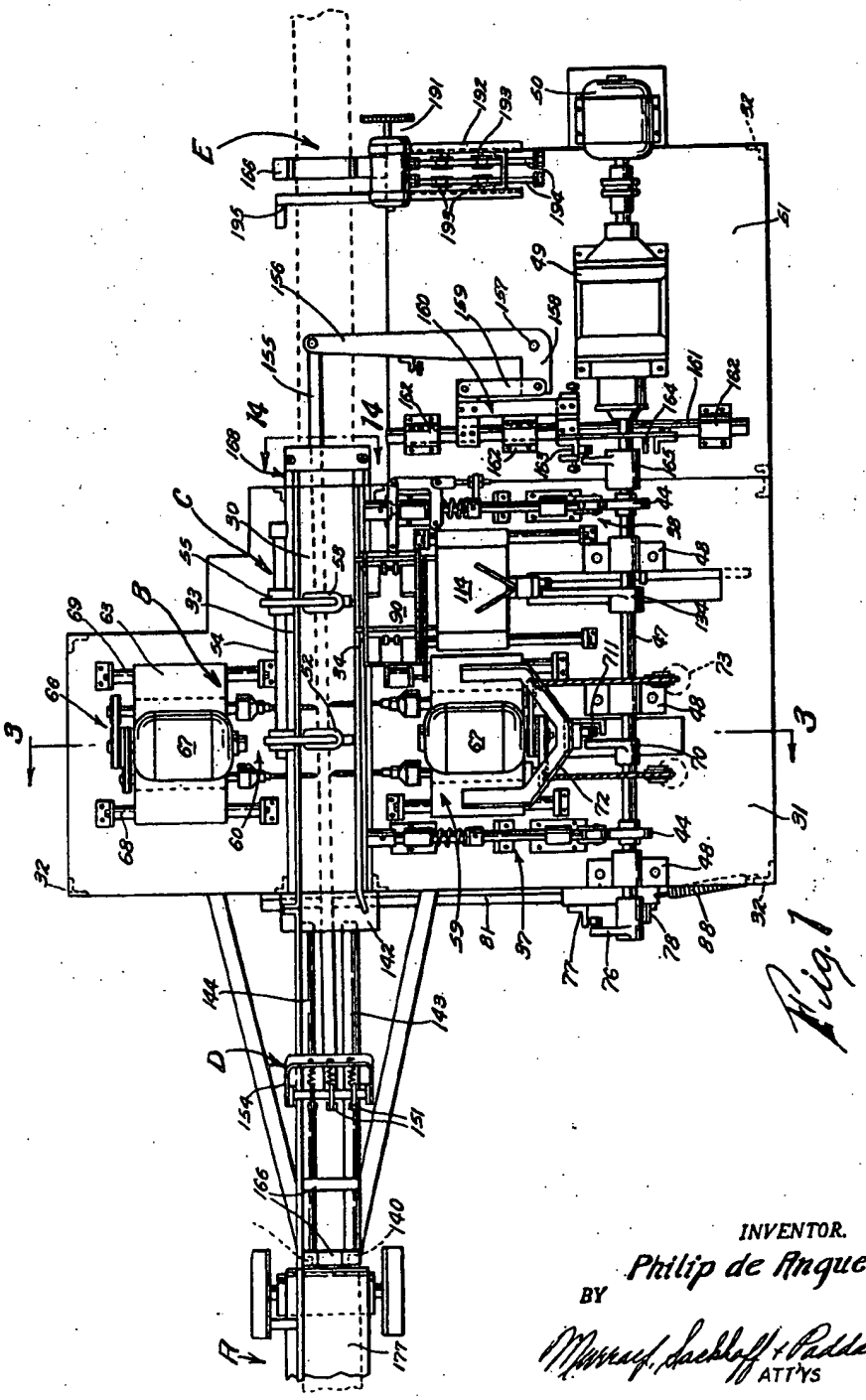

Fig. 1

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PIN INSERTING MACHINE FOR MAKING A STRUCTURAL UNIT

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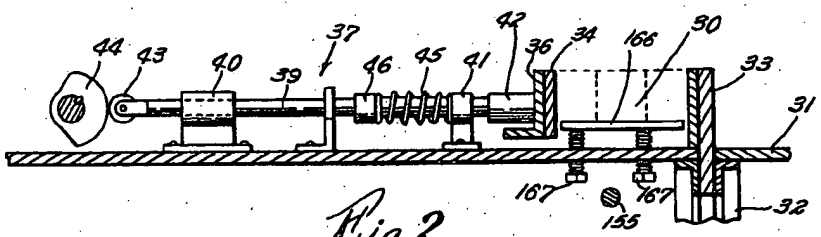

Fig. 2

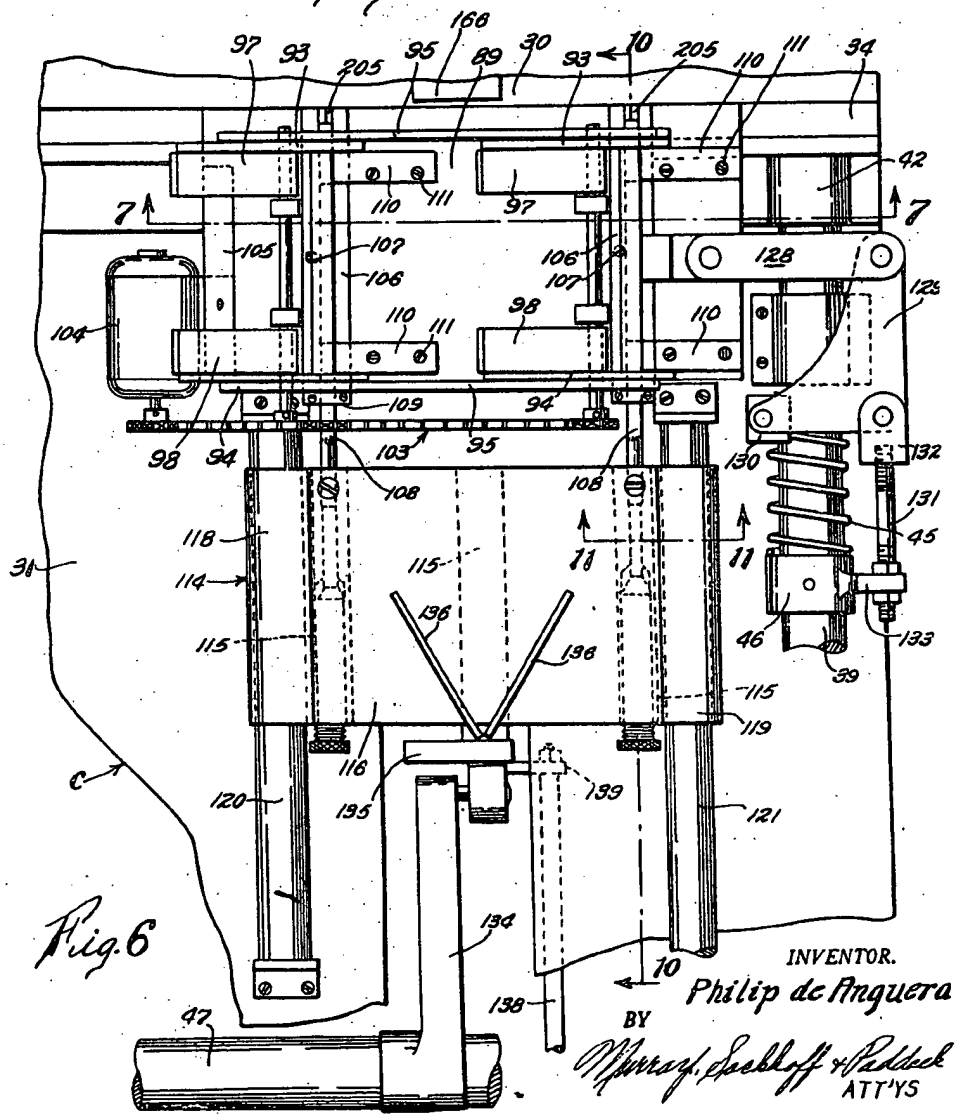

Fig. 6

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PIN INSERTING MACHINE FOR MAKING A STRUCTURAL UNIT

Filed Nov. 1, 1946 6 Sheets-Sheet 3

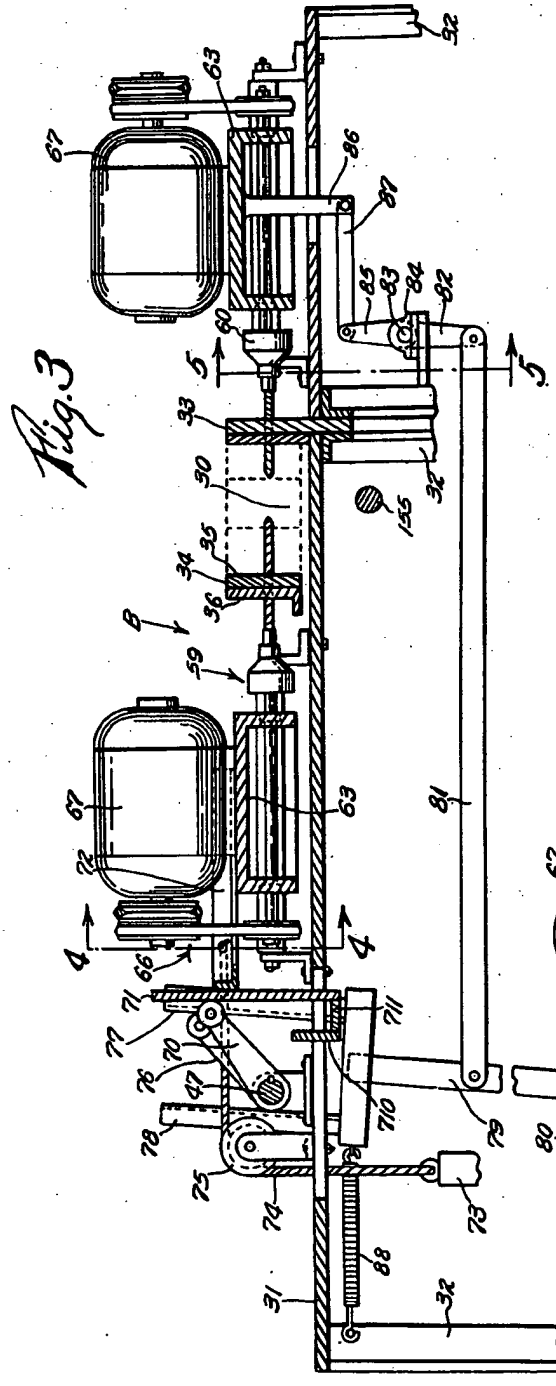

Fig. 3

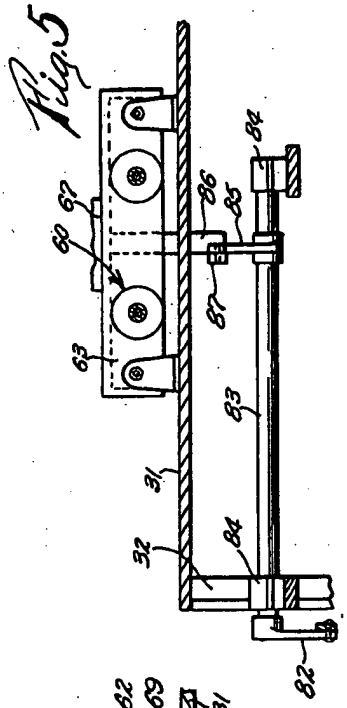

Fig. 5

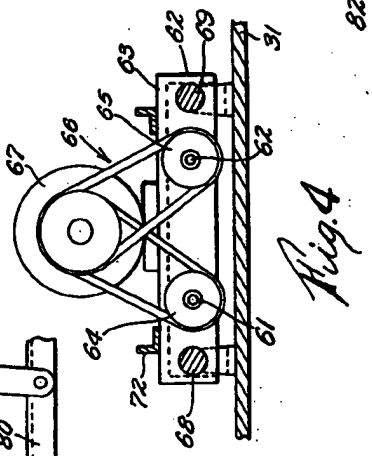

Fig. 4

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Sept. 11, 1951 P. DE ANGUERA 2,567,191

PIN INSERTING MACHINE FOR MAKING A STRUCTURAL UNIT

Filed Nov. 1, 1946 6 Sheets-Sheet 4

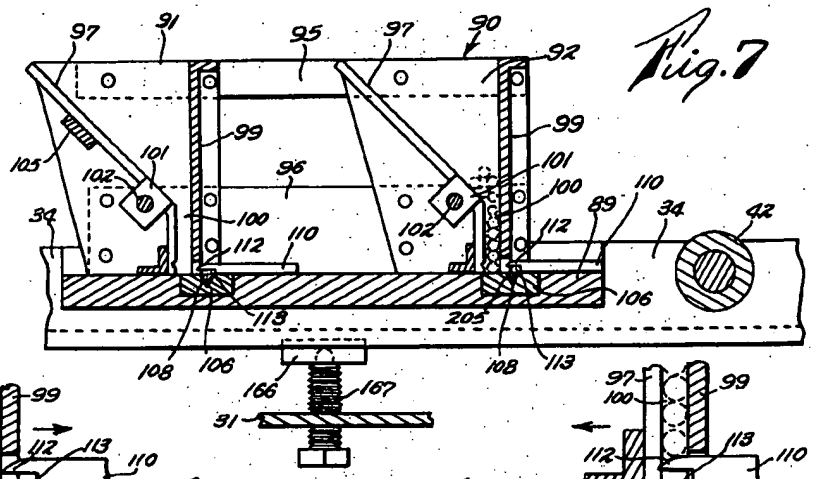

Fig. 7

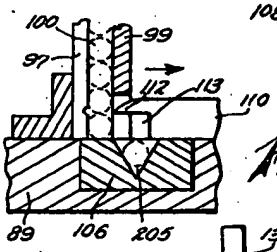

Fig. 8

Fig. 9

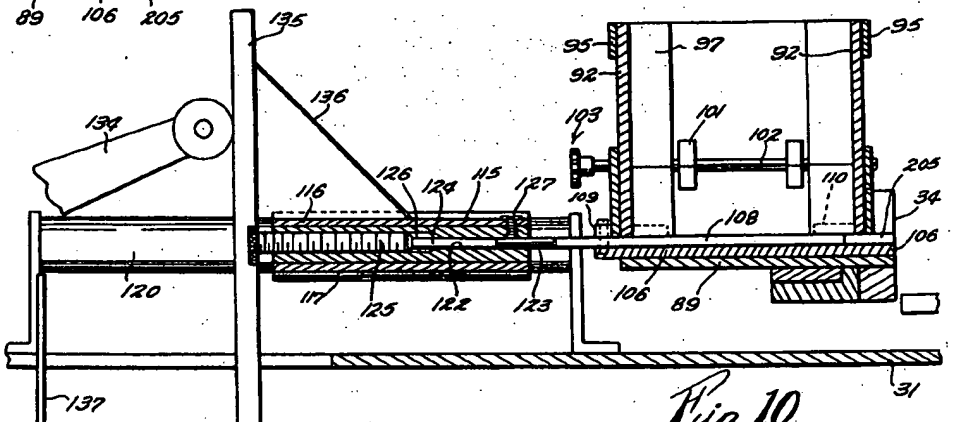

Fig. 10

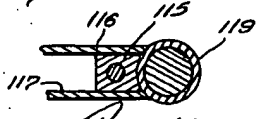

Fig. 11

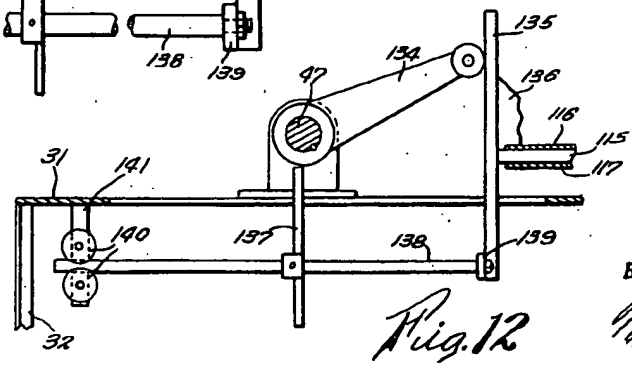

Fig. 12

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Sept. 11, 1951 P. DE ANGUERA 2,567,191

PIN INSERTING MACHINE FOR MAKING A STRUCTURAL UNIT

Filed Nov. 1, 1946 6 Sheets-Sheet 5

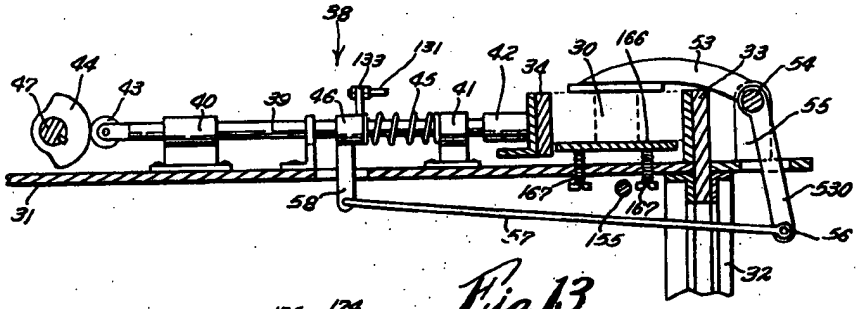

Fig. 13

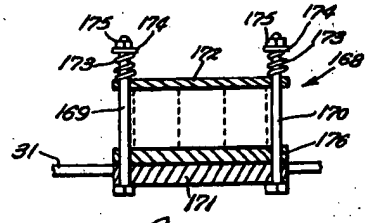

Fig. 14

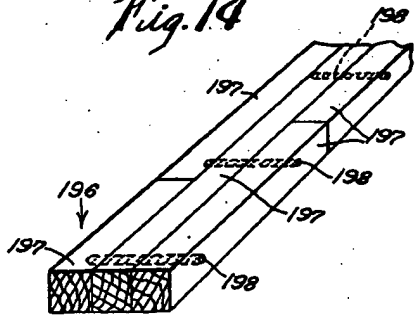

Fig. 22

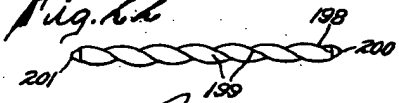

Fig. 23

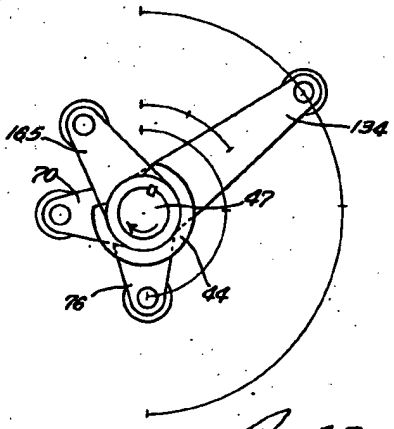

Fig. 15

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PIN INSERTING MACHINE FOR MAKING A STRUCTURAL UNIT

Filed Nov. 1, 1946 6 Sheets-Sheet 6

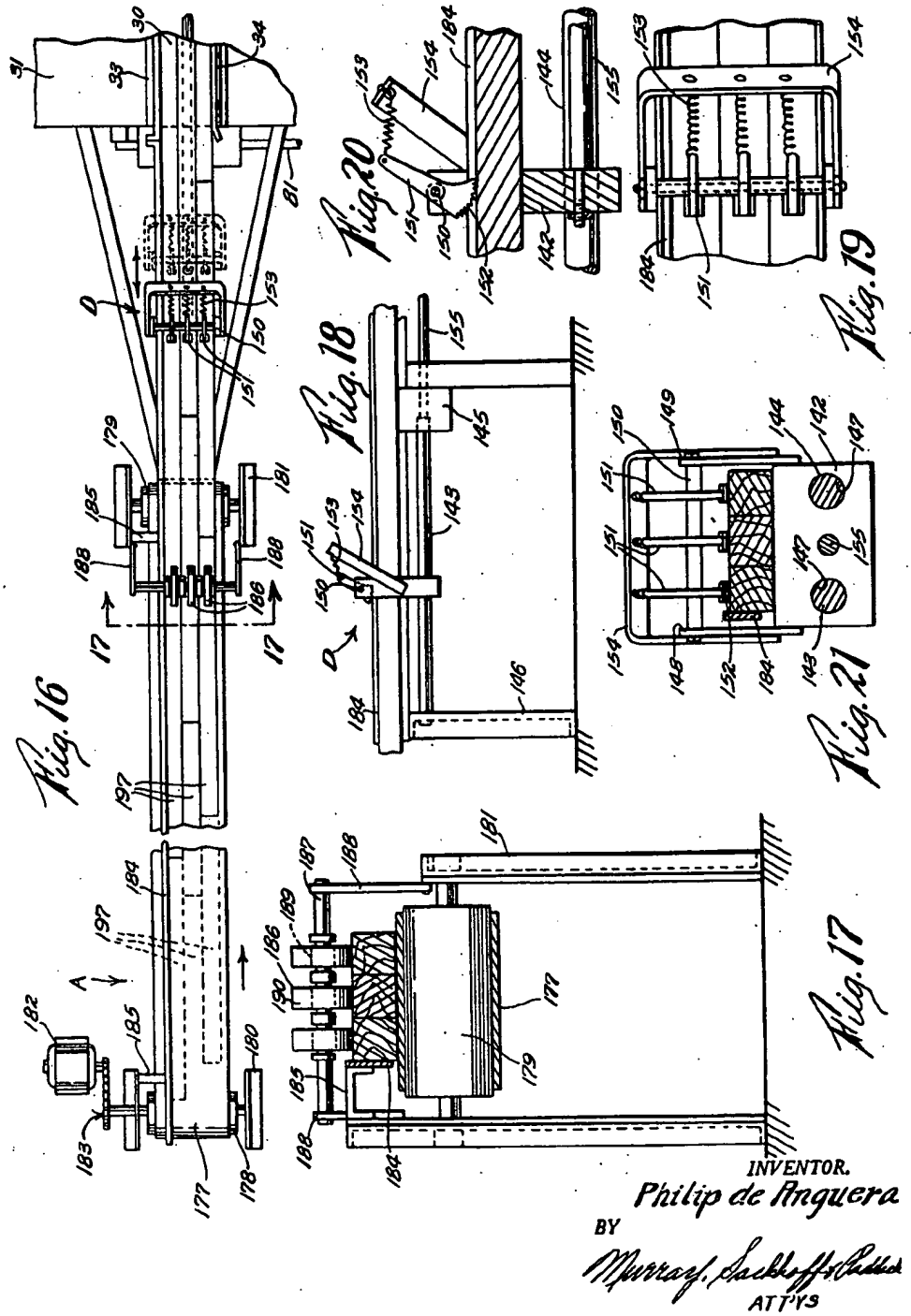

Fig. 16

Fig. 18

Fig. 20

Fig. 19

Fig. 21

Fig. 17

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Patented Sept. 11, 1951 2,567,191

UNITED STATES PATENT OFFICE

2,567,191

PIN INSERTING MACHINE FOR MAKING STRUCTURAL UNITS

Philip de Anguera, Cincinnati, Ohio, assignor to Eva de Anguera, Cincinnati, Ohio

Application November 1, 1946, Serial No. 707,127

4 Claims. (Cl. 144—31)

1

The present invention relates to a method and a machine for making a structural member and is particularly directed to means for manufacturing a composite member from a number of wood strips having indiscriminate lengths. Said composite member and the novel features therefor form the subject matter of my copending application, Serial Number 676,440, filed June 13, 1946, and now abandoned.

An object of this invention is to provide a means for economically interconnecting, in adjacent rows, a number of wood strips of unequal lengths to thereby produce a composite structural unit adapted for flooring panel in the construction of truck bodies, barge or ship decks, railroad freight cars, in factories and warehouses, or in other places which are subject to intense wear and are constantly exposed to changes of temperature and/or moisture conditions.

Another object of the invention is to provide a new and useful machine of the foregoing character in which the parts are so combined and organized that the structural member is produced continuously and economically in a single length.

A further object of the invention is to provide an integrated means for assembling, feeding and interconnecting a number of unequal lengths of wood strips into a composite structural member.

The invention also contemplates a sequence of novel, operational steps for accomplishing the foregoing novel functions and results.

To the above end, generally stated, the invention consists of the novel steps, devices, and combination of devices, hereinafter described and defined in the appended claims.

Referring to the drawings:

Fig. 1 is a fragmental, plan view of the preferred embodiment of my machine for making a structural member.

Fig. 2 is a transverse, cross-sectional view taken through the machine and showing in side elevation one of a pair of work clamp means.

Fig. 3 is an enlarged cross-sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a cross-sectional view taken on line 4—4 of Fig. 3.

Fig. 5 is a cross-sectional view taken on line 5—5 of Fig. 3.

Fig. 6 is an enlarged plan view of the pin driving device for the machine, parts thereof being broken away.

Fig. 7 is a cross-sectional view taken on line 7—7 of Fig. 6.

Fig. 8 is an enlarged cross-sectional view of the

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pin feeding device in the position illustrated in Fig. 7.

Fig. 9 is a view similar to that of Fig. 8 showing the pin feeding device in an intermediate pin feeding position.

Fig. 10 is a cross-sectional view taken on line 10—10 of Fig. 6.

Fig. 11 is a cross-sectional view taken on line 11—11 of Fig. 6.

Fig. 12 is a fragmental, cross-sectional view taken on a line similar to that of Fig. 10 showing the operating means for the pin driver in side elevation.

Fig. 13 is a cross-sectional view similar to Fig. 2 showing the remaining operating means for the work clamp of the machine.

Fig. 14 is an enlarged cross-sectional view taken on line 14—14 of Fig. 1.

Fig. 15 is a diagrammatic view of the actuating means for coordinating the functions of the various devices of the machine.

Fig. 16 is a plan view of the strip assembly station for my machine.

Fig. 17 is an enlarged cross-sectional view taken on line 17—17 of Fig. 16.

Fig. 18 is a fragmental side elevational view of the work feed device for the machine illustrated in Fig. 1.

Fig. 19 is a fragmental top plan view of the work feed.

Fig. 20 is a longitudinal sectional view taken through the work feed shown in Fig. 19.

Fig. 21 is a transverse sectional view taken through the work feed illustrated in Fig. 19.

Fig. 22 is a fragmental perspective view of the completed structural unit made by my machine and method.

Fig. 23 is an elevational view of one of the interconnecting dowels for producing the structural unit.

The preferred embodiment of my invention comprises a machine having a wood strip assembling station A, a drilling station B, a pin driving station C, and a means D for intermittently advancing the assembled strips through a work guide 30 extending across the machine bed. A cutting station E is also provided at the work exit and for the machine for sawing the continuously formed structural member into suitable lengths, if desired. At the assembling station A a number of indiscriminate lengths of wood strips are manually placed upon the upper reach of a traveling conveyor to form a number of longitudinally disposed, adjacent rows of strips. These assembled strips are constantly urged toward the

intermittently actuated work advancing means D which progressively feeds the assembled strips through a work guide 30 extending across the machine bed. The assembled strips are progressively drilled and pinned at the stations B and C respectively and the interconnected strips forming a continuous structural member are ejected from the machine toward a cutting station E where said member is cut into suitable lengths.

The machine will now be specifically described and, with particular reference to Fig. 1, it comprises a machine bed or base 31 supported upon suitable legs 32, said bed having the work guide 30 extending across it and formed by a longitudinal, upstanding back plate 33 (Figs. 1, 2 and 3), anchored at its lower end between certain bed plates and their respective legs, and an oscillating clamp plate 34 opposed to and positioned in parallelism to the back plate 33. The clamp plate may comprise a flat, elongate metal block 35 secured, as by welding or the like, to a coextensive angle iron 36 which has its lower flange portion extending away from the work guide. The work clamp is supported and oscillated upon the machine base by a pair of identically formed work clamp operating means 37 and 38 each comprising a rod 39 mounted in spaced bearings 40 and 41 and having fixed to one of its ends a coupling block 42 which in turn is welded to the angle iron 36 of the clamp plate 34. The opposed end of the rod has a roller 43 mounted thereon which is constantly urged against the face of a cam 44 by means of a compression spring 45 exerting an expanding force between the bearing 41 and a sleeve 46 fixed to the rod. The clamp operating means 37 is clearly illustrated in Fig. 2 whilst the clamp operating means 38 is shown in Fig. 13. The cams 44 and other operating cam arms are keyed to a common operating shaft 47 (Fig. 1) rotatably mounted upon the machine bed in spaced journal bearings 48 and driven through a speed reducer 49 by a motor 50, said speed reducer and the motor 50 being mounted upon a machine bed section 51 disposed somewhat lower than the machine bed 31.

As most clearly illustrated in Fig. 13 the clamp operating means 38 is adapted to close a pair of spaced work hold-down clamps 52 and 53 which are each fixed at their ends on a cross shaft 54 pivoted to the bed between upstanding bearings 55. The lower end of an arm 530 secured to the cross-shaft 54 is pivotally connected to an operating link 57 secured at its free end to a depending arm 58 formed on the sleeve 46. It will therefore be noted that upon rotation of the operating shaft 47 that cams 44 will oscillate the clamp plate 34 transversely of the work and alternately compress and release the work within the guide 30 whilst the clamps 52 and 53 will be simultaneously actuated with the clamp plate operation to hold the work down upon the work supports within the guide.

During the elapsed time when the clamp plate 34 and the hold-down clamps 53 are operative to compress the work, transverse holes are drilled through the work and pins are driven into prebored holes by the mechanisms at the drilling station B and the pin driving station C respectively. The drilling mechanism is best illustrated in Figs. 3, 4 and 5 and comprises a pair of drilling devices 59 and 60 mounted upon the base, on opposed sides of the work guide 30, for axial reciprocating movement at right angles to the longitudinal extension of said guide. As most clearly illustrated in Figs. 1 and 4, each of the drilling devices may have a pair of spindles 61 and 62 which are each journaled in a suitable carrier frame 63 and are continuously driven by pulleys 64 and 65 respectively through a belt drive 66 with a frame mounted motor 67. As most clearly illustrated in Fig. 3, the carrier frames for the pair of drilling devices are identical in construction and each are mounted for transverse reciprocating movement relative to the work guide upon spaced guide rods 68 and 69 which pass through aligned openings formed in opposed sides of the frame 63. The guide rods 68 and 69 are each mounted upon the machine by end brackets which are suitably bolted to the bed 31. The drilling device 59 is provided with feed and return reciprocating movement by an arm 70 which is keyed to the driven shaft 47. The drilling device is fed upon contact of the arm with the camming surface of a vertical plate 71 mounted on the carrier frame 63 by a triangularly-shaped bracket 72. The return stroke of the drilling device is effected by a plate 710 mounted to the lower portion of the plate 71 by a spacer block 711. A pair of weights 73 is suspended by a cable 74 fastened to the frame 72 and passing over a fixed pulley 75 to provide a positive return stroke for the drilling device.

The drilling device 60 is reciprocated by a cam arm 76 keyed to the end of the driven shaft 47 and alternately engaging the upstanding arms 77 and 78 of a fork-shaped member 79 pivotally mounted at its lower end to a cross-member 80 of the table undercarriage (Fig. 3). A link 81 is pivoted to an intermediate portion of the member 79 and engages at its free end a depending arm 82 secured to the end of a crank shaft 83 which in turn is mounted between journal bearings 84 secured to the machine frame in any suitable manner. An upstanding arm 85, fixed to the shaft 83, is connected by link 87 to a depending lug 86 formed on the carrier frame 63 for the drilling device 60. The return stroke of the drilling device 60 is effected by means of a spring 88 which is secured to the member 79 and to a leg 32 of the machine table. With particular reference to Figs. 3 and 15 it will be noted that the cam arm 70 is fixed to the shaft 47 an angular distance in advance of cam arm 76 to the end that the drilling spindle of the device 59 will have completed its feed stroke to the center of the work and begun its return stroke when the drilling spindle for the device 60 is advanced into the work to overrun the path of the drilling device 59 and complete a transverse bore through the work.

Upon return of the drilling devices 59 and 60 to their inoperative positions, the work is advanced a definite predetermined distance by the advancing means D so that the holes formed thereby are brought into transverse alignment with a pair of pin driving devices at the station C. As illustrated in Figs. 6–12 inclusive, the pin driving mechanism has a horizontal table 89 mounted at its inner end to the clamp plate 34. Preferably the clamp member is provided with an open slot into which the forward end of the table 89 is inserted and said member is fixed therein by welding the end to the clamp member. Mounted upon the table for longitudinal reciprocation is a pin box 90 having a pair of pin magazines 91 and 92 formed therein. The side walls for the box are each formed by a pair of spaced, vertically disposed plates 93 and 94 fixed together by straps 95 and 96. An open bottom for each

magazine is formed by inclined bars 97 and 98 which are welded to the opposed side walls and extend downwardly to the level of the top surface of the table 89. The end wall of each magazine is formed by a transverse plate 99 which is secured at its sides to the opposed side walls 93 and 94. As most clearly illustrated in Fig. 7 the inclined bars 97 have vertically disposed lower portions which form a restricted passageway 100 with the end wall and each magazine therefore has a tapered bottom terminating at its bottom in a passageway to singly guide the pins downwardly from the magazine to a pin feeding position.

The pins are continually agitated within the magazines, to insure the bottom-most pin therein falling into the narrow passageway, by square agitating blocks 101 secured to transverse shafts 102 and driven therethrough by a chain and sprocket arrangement 103 by a motor 104 suitably mounted upon a cross-member 105 extending between the bars 97 and 98. Hardened steel, pin guide inserts 106 are secured within suitable transverse recesses formed in the horizontal table 89 by counter-sunk screws 107. The pin guide inserts are each provided with a triangularly-shaped groove 205 which extends across its entire transverse extent and which is adapted to receive the bottom-most pin from the passageway 100 and permit a triangularly-shaped plunger 108 to drive it axially from the recess and into the aligned pre-bored opening formed in the work. The inner end of the insert extends beyond the edge of the table and the exposed groove portion is capped by a hardened steel block 109 for embracing the outer end of the plunger 108 when the plunger is in inoperative position.

The box 90 is guided for reciprocating, sliding movement upon the table by means of four spaced blocks 110 which are secured to the table by counter-sunk screws 111 and as clearly illustrated in Fig. 7, the blocks are disposed upon the guide inserts 106 and have an upper tapered portion 112 which overhangs the groove 205 and forms between said portion and the insert a pin receiving groove 113. The transverse wall 99 is cut away to permit the tapered portion of the blocks to enter within the pin passageway 100 when the box 90 is reciprocated.

The means for feeding and returning the plungers 108 comprises a plunger head 114 which has three longitudinally spaced, transversely positioned blocks 115 fixed to and interconnecting a pair of spaced plates 116 and 117. The transversely extending ends of the plates are secured, as by welding, to spaced guide tubes 118 and 119 (Fig. 11). Transverse guides 120 and 121 are mounted upon the machine bed by suitable brackets passed through the tubes 118 and 119 respectively and serve to support and guide the plunger-head for transverse reciprocating movement upon the machine bed. As most clearly illustrated in Fig. 10, the end blocks 115 are provided at their forward ends with a reduced internal bore 122 for receiving the mounting shank 123 of the plungers 108. A cylindrical extension 124 is formed on the forward end of a set screw 125 which is threaded in an enlarged bore 126 in the blocks and axially aligned with the reduced bore 122. A set screw 127 is adapted to anchor the plungers in the plunger-head against axial withdrawal therefrom.

The pin box is reciprocated longitudinally when the work clamp is actuated and released by means of a link 128 pivotally mounted on the pin box and pinned at its free end to a rocker arm 129. The rocker arm is pivotally mounted on the machine base by bracket 130 and is rocked thereon by an actuating shaft 131 pivotally secured to the rocker by link 132 and adjustably secured at its free end to an extension 133 formed on the sleeve 46 of the work clamp shaft 39.

The pin driver is actuated by a cam arm 134 which is keyed to the cam shaft 47 and engages a cam plate 135 to provide the feed stroke for said plungers. The cam plate is secured to the central block 115 of the plunger-head and is also fastened to the head by angularly disposed gusset plates 136. The return stroke of the plunger-head is effected through engagement of the cam arm 134 with a cam plate 137 which is secured to the cam feed plate 135 by a link 138 (Figs. 10 and 12). The link 138 is bolted to extension 139 formed on the cam plate 135 and is supported at its rear portion between a pair of guide rollers 140 pivotally mounted beneath the machine bed on bracket 141.

With particular reference to Fig. 15 it will be noted that the return stroke of the pin driving mechanism is initiated just prior to the return stroke of the work clamp means but that the work clamp return stroke is accomplished in less time than the driving mechanism and therefore the pin box, attached to the clamp, is at rest in its inoperative position as the pin driver approaches its inoperative position thereby precluding the withdrawal of the pin plungers 108 from their respective recesses and permitting the plunger ends to come to rest beneath the capped portions 109 at the outer ends of said recesses.

When the work clamp is operative to laterally compress the work for simultaneous drilling and pin driving operations the pin box 90 will be in the position illustrated in Figs. 7 and 8 and it will be noted that, in said position, the lowermost pin of the stack is in the groove 205 for axial driving movement into the work by the plungers. After said pins have been driven into the work by the plungers, the work clamp is released and said movement will be transmitted through the rocker arm 129 and its associated mechanism to the box which in turn will be moved in the direction of the arrow in Fig. 8 to assume the inoperative position illustrated in Fig. 9. This movement of the box and work clamp is instituted after the plungers have been withdrawn from the grooves and said movement will cause the passageways 100 to move into alignment with the grooves and in so doing the tapered portion 112 on each block 110 will enter between the two lowermost pins and allow only the bottom pins to be pushed into their respective grooves by the lowermost portions of the walls 97. The tapered portion also serves during said movement to slightly raise the entire stack of pins to preclude clogging of said stack by disarrangement of the pins therein. Upon actuation of the work clamp the box 90 will again move to the position illustrated in Figs. 7 and 8 whereby the lowermost pins are in their respective slots and the pin stacks rest upon the inserts with the lowermost pins therein in position to be pushed into their respective grooves upon the next actuation of the feed box by the work clamp.

The work is intermittently moved through the work guide 30 at the advancing station D by a work pull head comprising a block 142 guided for reciprocating movement upon a pair of spaced longitudinally extending guide rods 143 and 144 (Figs. 18–21 inclusive) secured at their inner ends

to the machine bed by a suitable fastening means 145 and supported at their outer ends in legs 146. As illustrated in Fig. 21, the rods pass through annular guide openings 147 formed longitudinally through the block 142 so that said block may have a longitudinal, planetary movement. Extending upwardly from the sides of the block and fastened thereto are two spaced ears 148 and 149 which support between them a shaft 150 upon which a number of spaced work-engaging dogs 151 are pivotally mounted. As most clearly indicated in Fig. 20, the dogs are provided with serrated work-engaging cam faces 152 and said dogs are urged toward camming action with the work by springs 153 which extend between the upper ends of the dogs and a U-shaped bracket 154 secured, as by welding, to the outer sides of the upstanding ears 148 and 149. The work advancing means is actuated by an elongated rod 155 which is bolted to the block 142 and extends beneath the machine bed and pivotally fastened to a bell crank lever 156 pivotally mounted at 157 to the machine bed 51 (Fig. 1).

The short arm 158 of the bell crank 156 is pivotally secured at its outer end to a link 159 which in turn is pivotally secured at its free end to a rigid frame 160 secured to a transversely reciprocating shaft 161. The shaft 161 is mounted upon journal bearings 162 secured to the machine bed and said rigid frame is provided at its rear end with a feed cam plate 163 and a spaced return cam plate 164 both in position to be engaged by a rotating cam arm 165 keyed to the driven shaft 47.

The work is supported throughout its travel upon transversely extending and longitudinally spaced work supports 166 as it is intermittently moved through the work guide 30 by the means D. As most clearly indicated in Figs. 1, 2 and 13, these work supports may be adjustably mounted for vertical movement on the machine bed 31 by a pair of set screws 167 which are threaded through the bed and rotatably secured to the underside of said supports. The vertical adjustment provides a means for adjusting the machine to produce structural members of varying thicknesses by making adjustments in the vertical positions of said work supports.

As illustrated in Figs. 1 and 14, the work is intermittently advanced through the machine against the action of a yieldable work clamp 168 which retards the forward movement of the work and forms in conjunction with the work feeding means D a positive means for progressively advancing the work a definite distance during each feed stroke of the work feeder This work clamp is clearly illustrated in Fig. 14 wherein a pair of spaced tie-bolts 169 and 170 project from an extension 171 formed on the table 31. The upper ends of the bolts pass through openings formed in a clamp plate 172 and said plate is yieldingly urged against the work by compression springs 173 disposed between the plate and an adjustable washer 174 encircling the upper end of the bolt and backed by a nut 175 threaded to said bolt. A suitable filler block 176 is positioned upon the extension 171 to accommodate the clamp for various thicknesses of work passing therethrough.

The wood strip assembling means A is particularly illustrated in Figs. 16, 17 and 18 and is there illustrated as an endless belt 177 passing around and supported by end rollers 178 and 179 journaled in suitable supporting standards 180 and 181 respectively. The roller 179 is disposed adjacent the outer end of the intermittent feed station B for the machine and is positioned so that the upper reach of the belt is on the same level with the work supports 166 and is adjacent to the outer support therefor. The belt is driven at a rate of speed in excess of the rectilinear speed for the feeding stroke of the intermittently actuated work clamp by a motor 182 through sprocket and chain arrangement generally indicated by the reference numeral 183. A longitudinal guide 184 is positioned along one side of the conveyor and is supported above the belt by suitable brackets 185 secured to the standards 180 and 181, said guide extending through the work advancing station and disposed in alignment with the stop plate 33 for the work guide 30 extending across the machine bed. A number of hold-down rollers 186 are mounted upon a transversely extending shaft 187 which is secured to the standard 181 by spaced arms 188. The wheels are made from a heavy metal, and are provided with oversize bearing holes 189 to compensate for varying thicknesses of wood strips, suitable sleeves 190 being fixed to the shaft 187 to maintain the wheels in position above their respective rows of strips.

It is also contemplated that my machine have a means for cutting the finished structural unit into desired lengths and, to this end, I have provided a saw station E at the work exit end of the machine, said saw station having a circular saw and motor 191 secured to a transversely reciprocating frame 192. The frame is provided with rollers 193 which move upon tracks 194 secured to the machine bed 51. The saw may be moved transversely through the work when the latter is at rest by a manually operated lever 195 or it may be synchronized with a part of the machine which is actuated when the work is at rest; such as the drilling devices or the plunger-head feeding device.

Operation

In order to facilitate the description of the operation of my machine and the method for making a structural member, the member will first be described and as indicated in Figs. 22 and 23 the member 196 comprises a number of unequal lengths of green wood strips 197 assembled in adjacent longitudinal rows and fixed therein by transversely extending, longitudinally spaced dowel pins 198. It will be noted that the grain of each green wood strip is disposed in a substantially upright or vertical position as it is assembled in its respective row so that the greater amount of expansion and contraction of the strips will take place in substantially vertical directions and preclude undue changes in the width of the completed structural unit. These pins are made of metal, are substantially square in cross-section, and are provided with spiral threads 199 which extend through their entire lengths. Both ends of the dowel pins are tapered as at 200 and 201, the tapered end 200 serving as a pilot to permit driving of the pin into the pre-formed holes in the work whilst the tapered end 201 provides a reduced contacting surface on the pin with the end of its driving plunger to thereby reduce friction between the pin and plunger when it is being driven into said pre-bored holes.

Square X Section PINS

In operation therefore a number of green lumber strips 197, having indiscriminate or unequal lengths, are manually positioned upon the continuously moving conveyor belt 177 at the assembly station A. The strips so assembled are disposed in end-to-end relationship to form a

number of longitudinal, adjacent rows, and the movement of the belt, upon which the longitudinal rows of strips are positioned, in conjunction with the hold-down rollers for the rows, constantly urges the assembled rows toward the intermittently actuated work advancing means D for the joining mechanism of the machine. The initial position for the work advancing means is illustrated in Fig. 16 in full lines whilst the end of said work advancing stroke is shown in dotted lines in said view, it being understood that the dogs 151 are urged toward camming action with the work by the springs 153 and the resistance of the work clamp 168 to the movement of the work through work guide 30 causes the dogs to instantly bite into and clamp the work in the advancing means so that each feed stroke will progressively advance the work an identical distance through the machine. The speed of the conveyor belt 177 is substantially greater than the speed of the feed stroke of the advancing means D so that the assembled strips will be constantly urged in end-to-end abutting relationship during the feed stroke of the advancing means and also when the advancing means is returned or at rest.

Whilst the advancing means is at rest, the clamp plate 34 is transversely operated to compress the adjacent rows of strips together against the stop plate 33 and simultaneously with the operation of said clamp plate, hold-down clamps 52 and 53 compress the strips in a vertical direction whereupon the drilling devices 59 and 60 are fed into the work to form a pair of throughbores extending transversely through the work. Upon return of the drilling devices, the work clamp is released and the work advancing means D moves the work a definite distance through the work guide 30 until the pair of bores in the work are in transverse alignment with the pin driver station C. The work clamp is again actuated and the drilling devices and the pin driving mechanism thereafter are fed and returned simultaneously relative to the work and the pins are driven into pre-bored holes formed in the work. Upon return of the drilling devices and the pin driving mechanism to inoperative position, the work clamp is withdrawn and the work again advanced a predetermined distance through the guide. This cycle is continued thus forming a continuous structural unit which moves from the exit end of the machine and is cut into suitable lengths at the saw station E.

What is claimed is:

1. In a machine for making a structural member the combination with a base, and a horizontal work guide on the base having an elongate, stationary back plate and a transversely movable, elongate clamp plate disposed in parallelism with the back plate, of a table mounted on the clamp plate and having an open-topped, transversely extending pin holding recess formed therein, a pin box positioned for longitudinal sliding movement upon the table, a pin magazine in the box, a pin feeding passageway depending from the magazine and normally disposed above the recess to receive the lowermost pin from the passageway, a reciprocating plunger axially movable in the recess and normally adapted to axially drive the pin from the recess into a structural member held in the work guide, and means on the base for reciprocating the box and adapted to move the passageway out of alignment with the pin recess when the plunger is at the end of its driving stroke and to return the passageway and recess to normal positions prior to the succeeding plunger drive stroke.

2. In a machine for making a structural member the combination with a base and a horizontal work guide on the base having an elongate, stationary back plate and a transversely movable, elongate clamp plate disposed in parallelism with the back plate, of a table mounted on the clamp plate and having an open-topped, transversely extending pin holding recess formed therein, a pin box positioned for longitudinal sliding movement upon the table, a pin magazine in the box, a pin feeding passageway depending from the magazine and normally disposed above the recess, spaced pin box guides fixed to the table adjacent the recess, upper tapered portions formed on the guides and normally overhanging the pin insert and forming with the table a pin receiving groove, a reciprocating plunger axially movable in the recess and normally adapted to axially drive a pin from the recess into a structural member held in the work guide, and means on the base for reciprocating the box and adapted to move the passageway out of alignment with the pin recess when the plunger is at the end of its driving stroke to permit the lowermost pin therein to fall upon the table and to return the passageway and recess to normal positions prior to the succeeding plunger drive stroke.

3. In a machine for making a structural member the combination with a base, and a horizontal work guide on the base having an elongate, stationary back plate and a transversely movable, elongate clamp plate disposed in parallelism with the back plate, of a table mounted on the clamp plate and having an open-topped, transversely extending pin holding recess formed therein, a pin box positioned for longitudinal sliding movement upon the table, a pin magazine in the box, a pin feeding passageway depending from the magazine and normally disposed above the recess to receive the lowermost pin from the passageway, agitator blocks rotatably mounted beneath the magazine, a reciprocating plunger axially movable in the recess and normally adapted to axially drive the pin from the recess into a structural member held in the work guide, and means on the base for reciprocating the box and adapted to move the passageway out of alignment with the pin recess when the plunger is at the end of its driving stroke and to return the passageway and recess to normal positions prior to the succeeding plunger drive stroke.

4. In a machine for making a structural member the combination with a base, and a horizontal work guide on the base having an elongated, stationary back plate and a transversely movable, elongate clamp plate disposed in parallelism with the back plate, of a table mounted on the clamp plate and having an open-topped, transversely extending V-shaped pin holding recess formed therein, a pin box positioned for longitudinal sliding movement upon the table, a pin magazine in the box, a pin feeding passageway depending from the magazine and normally disposed above the recess to receive the lowermost pin from the passageway, a reciprocating V-shaped plunger axially movable in the recess and normally adapted to axially drive the pin from the recess into a structural member held in the work guide, and means for reciprocating the box and adapted to move the passageway out of alignment with the pin recess when the plunger

is at the end of its driving stroke and to return the passageway and recess to normal positions prior to the succeeding plunger drive stroke.

PHILIP DE ANGUERA.

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1725

LARSEN

Henhører til beskrivelsen til

patent nr. 84807

Fig. 1

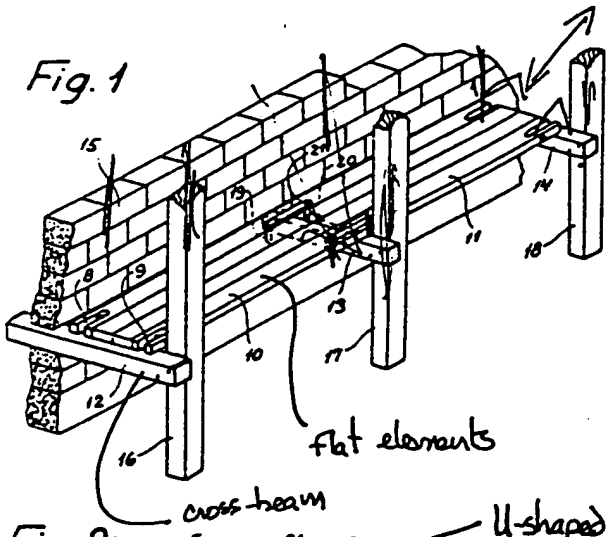


Fig. 2

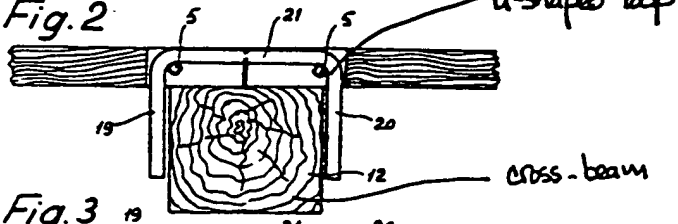


Fig. 3

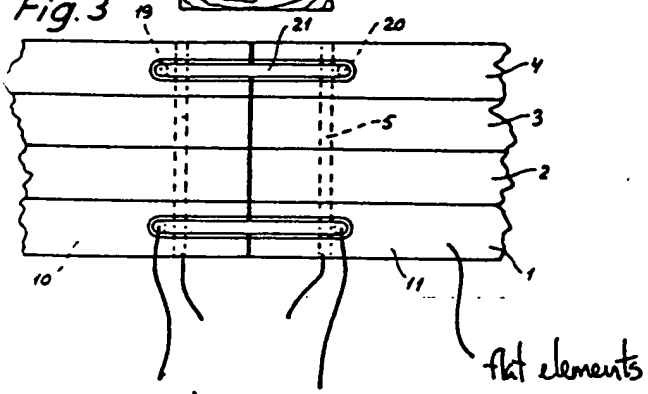


Fig. 4

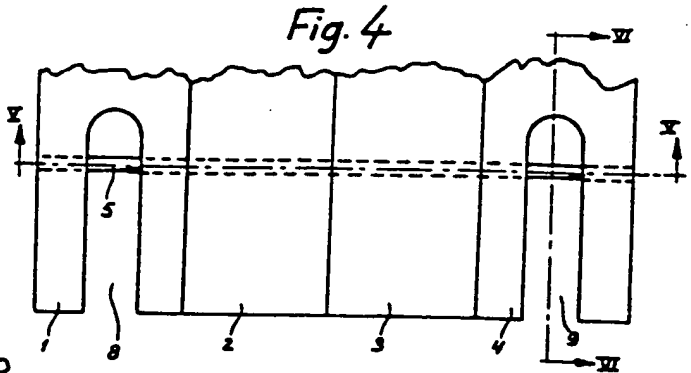


Fig. 5

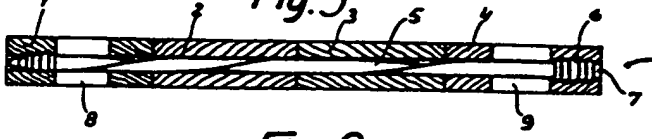
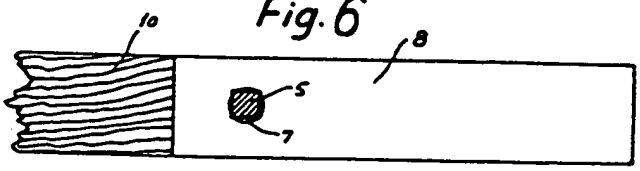


Fig. 6



- flat elements are supported by cross-beams having adjoining ends (?????)

- flat elements are in the longitudinal direction held together with the aid of U-shaped loops
- characterized in that e each end of each flat element there is one or more openings lying so far from the end of the element that they are not covered by the cross-beam
- in addition to the legs of the U-shaped element introduced into those holes projecting a little downward below the underside of the element

Larsen

Ans. nr. 4096/53.

Kl. 37 e - 9,01

Dansk Patent Nr. 84807

BESKRIVELSE

MED TILHØRENDE TEGNING

OFFENTLIGGJORT DEN 5. MAJ 1958

AF

DIREKTORATET FOR PATENT- OG VAREMÆRKEVÆSENET

DIREKTØR LARS PETER HOLGER LARSEN,

ÅRDEN.

Løbebro.

Patent udstedt den 6. januar 1958. Patenttiden løber fra den 14. december 1953.

Opfindelsen angår en løbebro bestående af fladeelementer, der er understøttet af tværbjælker ved de sammenstødende ender, og som i længderetningen er sammenholdt ved hjælp af U-formede bøjler.

Ved nogle af de kendte løbebroer af denne art er de U-formede bøjlers ben tilspidsede, således at bøjlerne kan slås ned i fladeelementerne, idet det ene ben af hver bøjle slås ned i et fladeelement nær dettes ende, medens det andet ben af bøjlen slås ned i det hertil stødende fladeelement. Bøjlens ben er ikke så lange, at de kan trænge helt gennem fladeelementet. Denne samlingsmåde har den ulempe, at fladeelementerne, der oftest består af brædde flager, ødelægges meget hurtigt ved inddrivningen af bøjlernes ben. Efter 4—5 ganges anvendelse er der så mange huller i brædderne, at de må udskiftes.

Ved andre kendte løbebroer er fladeelementerne sammenholdt ved hjælp af beslag, der er fastskruet eller fastboltet til fladeelementerne. Sådanne løbebroer er dog forholdsvis besværlige at montere, og endvidere er det uheldigt at anvende bolte eller skruer eller andre gevindele, idet gevindene i praksis ikke kan holdes fri for mørtel og desuden hurtigt ruster i fri luft.

Opfindelsen har til formål at udforme løbebroen på en sådan måde, at den kan monteres let og hurtigt, uden at det er nødvendigt at drive søm eller andre fastholdelsesorganer ind i fladeelementernes materiale, idet man herunder udformer samlingen mellem fladeelementerne på en sådan måde, at den medvirker til at forhindre en længdeforskydning af fladeelementerne i forhold til tværbjælkerne.

Løbebroen ifølge opfindelsen er med dette formål for øje ejendommelig ved, at der ved hver ende af hvert fladeelement er udformet ét eller flere huller, der ligger så langt fra elementets ende, at de ikke dækkes af tværbjælken, samt at de i disse huller indførte ben af de U-formede bøjler rager et stykke ned under undersiden af elementerne. Ved samlingen af fladeelementerne stikkes det ene ben af en U-formet bøjle ned i et hul i et fladeelement, medens bøjlens andet ben stikkes ned i det overfor liggende hul i det tilstødende fladeelement. Samlingen er således meget let og hurtig at udføre. Da benene rager et stykke ned under undersiden af fladeelementerne, vil benene låse fladeelementerne i forhold til tværbjælken, idet de rager ned langs hver sin side af denne. Ved anvendelsen af de nævnte huller i fladeelementerne undgår man fuldstændig at bruge søm eller andre fastholdelsesorganer, der skal drives ind i træet. Som følge heraf får fladeelementerne langt længere levetid, i visse tilfælde 10—20 gange så lang levetid som fladeelementer, der skal sømmes til tværbjælkerne. Takket være hullerne i fladeelementerne kan endvidere de U-formede bøjler fremstilles meget simpelt, f. eks. blot ved bukning af et stykke stangjern.

For at opnå en fuldstændig eller delvis forsænkning af bøjlerne i fladeelementerne, således at disse sidste får en glat overflade, kan der ifølge opfindelsen i den ene eller begge sider af hvert fladeelement være udformet en udsparing fra hvert hul ud til endekanten, hvilken udsparing har en bredde, der i det mindste er lig med bredden af de U-formede bøjlers forbindelsesparti mellem benene, og en dybde, der i hovedsagen er lig med højden af de U-formede bøjlers forbindelsesparti mellem benene, idet fladeelementet dog i dette tilfælde skal være væsentlig tykkere end den samlede dybde af udsparingerne. Hvis der som angivet er udformet ud-

sparinger i begge sider af hvert fladeelement, kan fladeelementerne vendes efter nogen tids brug, hvis de er blevet slidt eller beskadiget på den opad liggende side. Herved kan levetiden yderligere forlænges.

Ved de fleste af de kendte løbebroer består hvert af fladeelementerne af flere ved siden af hinanden anbragte brædder, som gennemtrænges af og er sammenholdt med et tværgående forbindelsesjern ved hver ende af elementet. I dette tilfælde kan ifølge opfindelsen hullerne i fladeelementet være beliggende inden for forbindelsesjernene, hvorved man effektivt forhindrer, at materialet mellem et hul og den nærliggende endekant af fladeelementet rives ud ved overbelastning af forbindelsen mellem to elementer eller ved stød- eller slagpåvirkning.

Hvis de omtalte forbindelsesjern anvendes, kan ifølge opfindelsen hver af hullerne i fladeelementerne være begrænset af det indre parti af en fra enden af elementet udgående og hele elementets tykkelse gennemtrængende slidse og af et tværs gennem slidsen gående forbindelsesjern. Herved sparer man at bore huller og at foretage udsparinger fra hullerne til endekanten af elementet. I stedet skal blot skæres en gennemgående slidse af den nævnte art, hvilket er langt lettere. De U-formede bøjlers forbindelsespartier vil blive tilstrækkelig undersænket i elementerne, når de hviler på forbindelsesjernene, der sædvanligvis er inddrevet midt i tykkelsen af elementerne.

På tegningen er opfindelsen anskueliggjort skematisk, idet

fig. 1 er et perspektivisk billede af et stykke murværk med et stillads forsynet med en løbebro ifølge opfindelsen,

fig. 2 er et længdesnit gennem løbebroen i større målestok,

fig. 3 viser en del af løbebroen, set fra oven,

fig. 4 viser et endeparti af et fladeelement, set fra oven,

fig. 5 er et snit efter linien V—V i fig. 4, og

fig. 6 er et snit efter linien VI—VI i fig. 4.

På tegningen betegner 1, 2, 3 og 4 brædder, der i nærheden af hver ende er forbundet med et forbindelsesjern 5 i form af en snoet jernstang med kvadratisk tværsnit. Forbindelsesjernene 5 er inddrevet gennem cylindriske huller 7 i brædderne. I brædderne 1 og 4 er der fra enderne udformet slidser 8 og 9, der strækker sig lidt forbi forbindelsesjernene 5. Der er herved dannet fladeelementer, der i fig. 1 og 3 er betegnet ved 10 og 11. Disse er anbragt med deres ender hvilende på stikbomme 12, 13 og 14, som er støttet dels i murværk 15, dels på rejsebomme 16, 17 og 18. De to fladeelementer er anbragt med deres ender tæt op til hinanden. En U-formet bøjle med to grene 19 og 20 og et forbindelsesparti 21 er bragt i indgreb med forbindelsesjernene 5 i de to fladeelementer 10, 11, og grenene 19 og 20 rager som vist i fig. 2 ned på hver sin side af stikbommen 12. Forbindelsesstykkerne 21 ligger forsænket i slidserne 8 og 9, så at ingen del rager op over oversiden af fladeelementerne. Der fås derfor en ganske jævn løbebro.

Patentkrav.

1. Løbebro bestående af fladeelementer, der er understøttet af tværbjælker ved de sammenstødende ender, og som i længderetningen er sammenholdt ved hjælp af U-formede bøjler, kendetegnet ved, at der ved hver ende af hvert fladeelement er udformet ét eller flere huller, der ligger så langt fra elementets ende, at de ikke dækkes af tværbjælken, samt at de i disse huller indførte ben af de U-formede bøjler rager et stykke ned under undersiden af elementerne.

2. Løbebro ifølge krav 1, kendetegnet ved, at der i den ene eller begge sider af hvert fladeelement er udformet en udsparing fra hvert hul ud til endekanten, hvilken udsparing har en bredde, der i det mindste er lig med bredden af de U-formede bøjlers forbindelsesparti mellem benene, og en dybde, der i hovedsagen er lig med højden af de U-formede bøjlers forbindelsesparti mellem benene, samt at fladeelementet er væsentlig tykkere end den samlede dybde af udsparingerne.

3. Løbebro ifølge krav 1—2, ved hvilken hvert fladeelement består af flere ved siden af hinanden anbragte brædder, som gennemtrænges af og er sammenholdt med et tværgående forbindelsesjern ved hver ende af elementet, kendetegnet ved, at hullerne i fladeelementet er beliggende inden for forbindelsesjernene.

4. Løbebro ifølge krav 3, kendetegnet ved, at hver af hullerne i fladeelementerne begrænses af det indre parti af en fra enden af elementet udgående og hele elementets tykkelse gennemtrængende slidse og af et tværs gennem slidsen gående forbindelsesjern.

Fremdragne publikationer:

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Norske patenter nr. 18794, 57937
Svensk patent nr. 28676
Tysk patent nr. 734589.

København 1958. J. H. Schultz A/S.

Danish Patent No. 84,807

Claim 1: Builder's ladder comprised of flat elements, which are supported by crossbeams, having adjoining ends, and which in the longitudinal direction are held together with the aid of U-shaped loops, characterized in that at each end of each flat element, there is one or more openings lying so far from the end of the element that they are not covered by the crossbeam, in addition to the legs of the U-shaped element introduced into these holes projecting a little downward below the under side of the element.

Danish Patent 84807 EXAMINER'S COPY /illegible/ 8

SPECIFICATION
with appurtenant drawing

PUBLISHED MAY 5, 1958

by

THE DANISH DIRECTORATE OF PATENTS, DESIGNS AND TRADEMARKS

LARS PETER HOLGER LARSEN, DIRECTOR

ARDEN

[handwritten annotation in English]: *Builder's ladder*

Walkway

Patent issued January 6, 1958. Patent valid as of December 14, 1953.

This invention concerns a walkway comprising surface elements supported by crossbeams at their contiguous ends and held together in their longitudinal direction by U-shaped clamps.

In some known walkways of this type, the legs of the U-shaped clamps are pointed, so that the clamps can be driven down into the surface elements, whereby one leg of each clamp is driven down into a surface element near the end thereof, while the other leg of the clamp is driven into the surface element in abutment therewith. The legs of the clamps are not of sufficient length to fully penetrate the surface element. This design has the disadvantage that the surface elements, which usually consist of planking, are destroyed very quickly as a result of the legs of the clamps being driven in. After four or five uses, there are so many holes in the planks that they must be replaced.

In other known walkways, the surface elements are held together by means of braces fixedly screwed or bolted to the surface elements. However, such walkways are comparatively more difficult to assemble, and the use of bolts, screws or other threaded components is also disadvantageous since, in practice, the threads cannot be kept free of mortar, and because they corrode rapidly in the open air.

The purpose of the invention is to produce a walkway that can be assembled easily and quickly, without the need to drive nails or other fastening devices into the material of the surface

elements, and wherein the joint between the surface elements is designed to help prevent the longitudinal displacement of the surface elements in relation to the crossbeams.

With this purpose in mind, the walkway according to the invention is characterized by the fact that each end of each surface element is provided with one or more holes located sufficiently far from the end of the element that they are not covered by the crossbeam, and that the legs of the U-shaped clamps inserted into these holes project downward a distance below the underside of the elements. To join the surface elements, one leg of a U-shaped clamp is inserted downward into one hole in a surface element, while the other leg of the clamp is inserted downward into the superjacent hole in the adjacent surface element. The joint may thus be made very quickly and easily. Because the legs project downward a distance below the underside of the surface elements, the clamps will lock the surface elements in relation to the crossbeam, since each leg extends downward along its own side of the crossbeam. The use of nails or other fastening devices that must be driven into the wood is entirely avoided through the use of said holes in the surface elements. As a result, the surface elements have far longer useful lives, in some cases as much as 10-to-20 times the useful lives of surface elements that must be nailed to the crossbeams. By virtue of the holes in the surface elements, the U-shaped clamps can also be made very simply, e.g., merely by bending a piece of bar iron.

In order to completely or partially countersink the clamps in the surface elements, in order to give the latter a smooth surface, one or both sides of each surface element can be provided, according to the invention, with a recess from each hole out to the terminal edge, which recess has a width that is at least equal to the width of the connecting section between the legs of the U-shaped clamps and a depth that is essentially equal to the height of the connecting section between the legs of the U-shaped clamps, since the surface element must still be considerably thicker than the combined depth of the recesses in this case. If both sides of each surface element are provided with recesses as described, then the surface elements can be turned over if their top sides should become worn or damaged after they have been used for some time. Their useful lives can thus be further extended.

In most known walkways, each of the surface elements comprises multiple planks arranged side by side and penetrated and held together by a transverse connecting iron at each end of the element. According to the invention, the holes in the surface element in this case can be arranged inside the connecting irons, thereby effectively preventing the material between a hole and the proximal terminal edge of the surface element from being torn out in the event of overloading of the joint between two elements, or by the effects of jolts or impacts.

According to the invention, if said connecting irons are used, each of the holes in the surface elements can be delimited by the inner part of a slot that extends outwardly from the end of the element and penetrates through the thickness of the entire element, and by a connecting iron that passes transversely through said slot. This eliminates the need for drilling holes and creating recesses from the holes to the terminal edge of the element. It is instead only necessary to cut a penetrating slot of the aforesaid type, which is far easier to do. The connecting sections of the U-shaped clamps will be sufficiently countersunk in the elements when they rest on the connecting irons, which are customarily driven midway into the thickness of the elements.

The invention is clarified schematically in the drawing, in which

Figure 1 gives a perspective view of a section of masonry with a scaffold provided with a walkway according to the invention,

Figure 2 shows a longitudinal section through the walkway on a larger scale,
Figure 3 shows a portion of the walkway in plan,
Figure 4 shows an end section of a surface element in plan,
Figure 5 is a section along line V - V of Figure 4 and
Figure 6 is a section along line VI - VI of Figure 4.

In the drawing, 1, 2, 3 and 4 denote planks that are joined near each of their ends by means of a connecting iron 5 in the form of a bent iron bar with a square cross-section. The connecting irons 5 are driven through cylindrical holes 7 in the planks. In the ends of planks 1 and 4 there are slots 8 and 9 proceeding from the ends and extending slightly beyond the connecting irons 5. Surface elements, which are denoted by 10 and 11 in Figures 1 and 3, are produced thereby. These surface elements are arranged with their ends resting on tie beams 12, 13 and 14, which are supported partly in the masonry 15 and partly on vertical posts 16, 17 and 18. The two surface elements are arranged with their ends tightly abutting each other. A U-shaped clamp with two forks 19 and 20 and a connecting section 21 is mounted in engagement with the connecting irons 5 in the two surface elements 10, 11, and each of the forks 19 and 20 projects downward on its own side of the tie beam 12, as shown in Figure 2. The connecting pieces 21 are countersunk in slots 8 and 9 so that no part thereof projects upwardly over the top of the surface elements. A completely smooth walkway is thereby produced.

CLAIMS

1. A walkway comprising surface elements supported by crossbeams at their contiguous ends and held together in their longitudinal direction by U-shaped clamps, characterized by the fact that each end of each surface element has one or more holes located sufficiently far from the end of the element that they are not covered by the crossbeam, and that the legs of the U-shaped clamps inserted into these holes project downward a distance below the underside of the elements.

2. A walkway according to Claim 1, characterized by the fact that one or both sides of each surface element according to the invention is provided with a recess from each hole out to the terminal edge, which recess has a width that is at least equal to the width of the connecting section between the legs of the U-shaped clamps and a depth that is essentially equal to the height of the connecting section between the legs of the U-shaped clamps, and that the surface element is considerably thicker than the combined depth of the recesses.

3. A walkway according to Claims 1 - 2, wherein each surface element comprises multiple planks arranged side by side and penetrated and held together by a transverse connecting iron at each end of the element, characterized by the fact that the holes in the surface element are located inside the connecting irons.

4. A walkway according to Claim 3, characterized by the fact that each of the holes in the surface elements is delimited by the inner part of a slot that extends outward from the end of the element and penetrates through the thickness of the entire element, and by a connecting iron that passes transversely through said slot.

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Norwegian patents 18794, 57937
Swedish Patent 28676
German Patent 734589

Copenhagen 1958. J. M. Schultz A/S

Oct. 2, 1951 H. M. BOUTON 2,569,450

CLAMP

Filed Aug. 1, 1947

Fig. 1

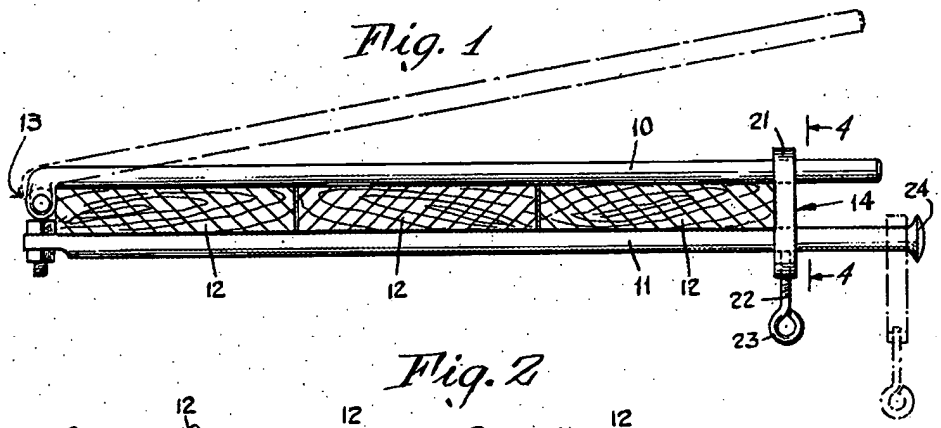


Fig. 2

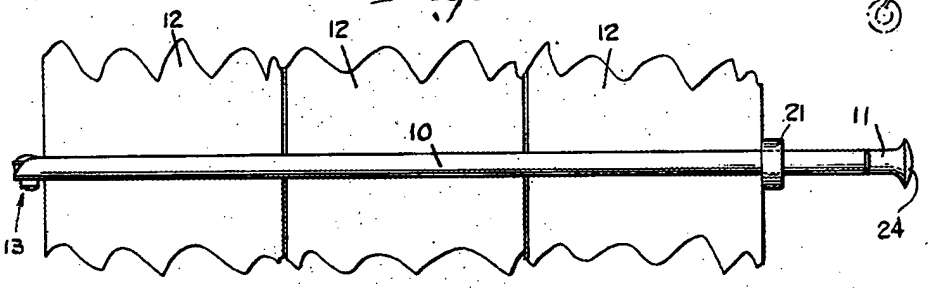


Fig. 3

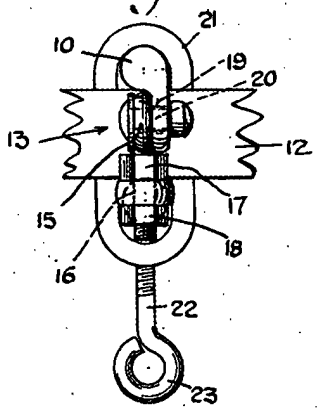
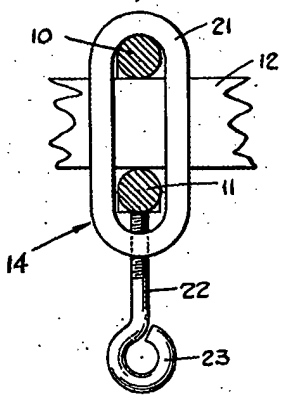


Fig. 4



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UNITED STATES PATENT OFFICE

2,569,450

CLAMP

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1 Claim. (Cl. 24—251)

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The present invention relates to clamps and particularly to clamps which may be employed for securing together the boards or planks forming the floor of scaffolding to provide a platform thereon.

Heretofore in erecting scaffolding the boards or planks forming the platform have been secured together in side-by-side relation, preferably with a space between the boards, by means of a cleat extending across the platform and nailed to the boards. This required a substantial amount of time in both the installation and in the removal of the scaffolding.

The present invention avoids this difficulty by providing a novel clamp which can be easily and quickly applied to the platform to hold the boards in desired relation and may be readily removed when it is desired to knock down the scaffolding.

The clamp of the present invention extends over the upper and lower surface of the platform and when drawn into clamping relation holds the boards against lateral movement.

A feature of the clamp of the present invention resides in the structure wherein platforms having boards or planks of various widths may be employed and clamped together with the required space between them or in edge-to-edge relationship and can be used for platforms of various widths.

Furthermore the clamp of the present invention is adjustable to accommodate planks of various thicknesses.

The clamp of the present invention is simple of construction, cheap to manufacture, and easy to install and remove.

Other features and advantages of the invention will be apparent from the specification and claim when considered in connection with the drawings wherein:

Figure 1 shows a side view of the clamp in clamped relation and in released position in dotted lines.

Fig. 2 is a plan view of the clamp.

Fig. 3 is a hinged end view.

Fig. 4 is a section taken along line 4—4 of Fig. 1.

As shown in the drawings, the clamp of the present invention comprises an upper bar 10 and a lower bar 11 of suitable rigid material adapted to extend across the planks or boards 12 arranged in side-by-side relation and forming the flooring or platform of the scaffold.

At one end, the bars 10, 11 are hinged together at 13 and at the other end a clamping means 14 is provided for drawing the bars into clamped

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relation with the upper and lower surface of the planks.

While the hinge may take several forms, in the preferred form of the invention it comprises an eye bolt 15 mounted in an aperture 16 in the bar 11 and secured therein by nuts 17, 18 threaded on the bolt and into engagement with the opposite sides of the bar. The upper bar 10 is pivotally mounted on the eye of the eye bolt. As herein illustrated the bar 10 is provided with an aperture 19 and a shaft 20, which may be a stud, rivet or the like, passes through the aperture 19 and the eye of the eye bolt and provides a pivot for the upper bar so that it may be swung from clamped position, shown in full lines, to the dotted line position in Fig. 1, to enable it to be readily moved into or out of assembled relation with the planks.

The thickness of the planks used in forming the platform may vary. In order that the clamp may be used to clamp such planks, provision is made whereby the spacing between the two bars can be adjusted to receive the planks. This is accomplished at the hinged end by varying the position of the eye bolt with respect to the bar 11, by proper adjustment of the nuts 17, 18 thereon.

While the clamping means 13 may take various forms, in the preferred form of the invention it comprises a rigid collar 21 slidable along the two bars, when the bars are in assembled relation about the planks, with the upper section of the collar engaging the bar 10 and the lower section provided with a clamping bolt 22 threaded therein and which is screwed into engagement with the underside of the bar 11. As the clamping bolt is tightened the collar is drawn into firm engagement with the upper side of bar 10 and the two bars are moved to clamp the planks between them. This clamping means will accommodate the various spacing of the bars as determined by the hinge means.

The bolt 22 may have various means whereby it may be tightened up. In the herein illustrated form of the invention it has an eye 23 through which an instrument may be inserted to apply turning force to the bolt. However, other equivalent structure may be employed to enable the clamp to draw the bars tightly into clamping relation with the upper and lower surface of the planks.

According to the present invention, means are provided whereby the clamping means will be held on the bars against accidental separation from the clamp and in a position wherein it can

be readily moved into clamping position. This is accomplished in the preferred form of the invention, by extending one of the bars beyond the other and providing the extended bar with an enlargement. As shown in Fig. 1, the lower bar is extended and the end of the bar is headed, as indicated at 24, and prevents the collar from slipping off the end of the bar during handling of the clamp. The extension of the lower bar provides a means for holding the collar in the dot-and-dash line position of Fig. 1 and after the two bars are in proper position the collar can be raised and slipped over the shorter end of the upper bar and in proper location thereon and the clamp then tightened.

In laying up a scaffold it is at present preferred to lay the planks side-by-side and leave a slight space therebetween since this prevents binding of the boards as they are walked upon and also permits small pieces of material which might fall on the scaffold to pass therethrough. The clamp bars, if they do not have the proper spacing for the thickness of the planks, are adjusted and the clamp swung in position about the planks and the collar moved over the bars and tightened to lock the planks in place.

While the clamp of the present invention can be used with spaced planks it can also be used with planks placed in edge-to-edge relation since the clamping pressure is exerted on the top and bottom of the boards and will hold them in any desired spaced relation.

Furthermore, the clamp of the present invention can be used to provide scaffold platforms of various widths as required because as above stated the clamping action is against the top and bottom of the boards. If, for example, two planks are used instead of the three planks, as shown in Fig. 1, the clamping collar can be moved into proper position on the bars and accurately hold the planks in place.

The clamp of the present invention, because of the simplicity of its structure can be readily accommodated to variations normally found in practice in scaffolding, can be easily installed and removed, and can be manufactured cheaply.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

A clamp for securing together a plurality of planks in side-by-side relation comprising a pair of rigid bars extending across the planks and adjustably hinged together at one end by hinge means including a rigid member having a pivoted connection to one of the bars whereby the bars may be readily swung open for easy insertion of the planks therebetween, said hinge means fixing the spacing between the bars at said end in accordance with the thickness of the planks; and means embracing the other ends of the bars and slidable thereon into engagement with the edges of plank assemblies of various widths to prevent lateral movement of said planks and having means for drawing said bars together and clamping said planks therebetween to prevent longitudinal movement of said planks.

HIRAM M. BOUTON.

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Alvin C. Chin-Shue
Examiner
Art Unit: 3634

PTO 2005-5734

Japanese Kokai Patent Application
No. Hei 1[1989]-267002

DOOR AND CONSTRUCTION METHOD THEREFOR

Eugene X. Anglehart

UNITED STATES PATENT AND TRADEMARK OFFICE
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DOOR AND CONSTRUCTION METHOD THEREFOR

[Tobira oyobi sono kosei hoho]

Inventor: Eugene X. Anglehart

Applicant: Eugene X. Anglehart

[Amendments have been incorporated into the text of the translation. The amendment to this patent is a clean copy of figures only. No changes were made to the text.]

Claims

1. As a door construction method,

a construction method that includes:

a. a step for adhering multiple lumber tie plates of roughly equal length together side-by-side, with the grain of the adhered lumber tie plates arranged in opposite directions,

b. and that includes a step for forming at least one open part that passes cuts across said lumber tie plates.

c. and for inserting a spline into said open part.

2. A construction method such that said lumber tie plate has side surfaces that are no more than 63.5 mm (2-1/2 inches) wide and parallel, in the door construction method described in Claim 1.

3. A construction method such that two open parts – said one open part near one end of said lumber tie plate and a second open part near the opposite ends of said lumber tie plate – are formed, in the door construction method described in Claim 1.

4. A construction method such that said open part is a hole, in the door construction method described in Claim 1.

5. A construction method such that said open part is a slot, in the door construction method described in Claim 1.

6. A construction method such that said spline is metal, in the door construction method described in Claim 1.

7. A construction method such that said spline is adhered inside said open part, in the door construction method described in Claim 1.

8. In the door construction method described in Claim 5,

d. a construction method provided with an additional step in which a wooden plug is inserted into each end of said open part and said metal spline is hidden by this.

9. In the door construction method described in Claim 6,

a construction method provided with an additional step in which said [sic] additional /2*
lumber tie plate is adhered to the lateral edge enclosing said open part, said metal spline is accepted matched with the end of said open part, and said additional lumber tie plate will have a stop hole to hide it because of this.

10. In the door construction method described in Claim 1,

a construction method that additionally includes: d. a step for polishing one side of said lumber tie plate to a finished state and producing a semi-finished door product with this,

e. a step for attaching a template that has a guide groove on the opposite side of said semi-finished door product from said finished side,

f. a step for placing said semi-finished door product on a router that has a table and a cutter so that a guide pin that projects upward from said table of said router locks in said guide groove of said template, [and]

(g) a step for moving said semi-finished door product so that said guide pin will remain in said guide groove and by this, said [sic] pattern delineated by said guide groove of said template will be reproduced on said semi-finished door product by said cutter of said router.

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* [The numbers in the right margin indicate pagination of the original foreign text.]

11. As the door,

a. a door that includes multiple lumber tie plates no more than 6.35 mm (2-1/2 inches) thick bonded side-by-side to each other, where the grain of adjacent lumber tie plates is arranged in opposite directions, said lumber tie plates have at least one open part that extends across them in which a spline is furnished.

12. A door such that said lumber tie plates are roughly the same length, in the door described in Claim 11.

13. A door such that said lumber tie plates are roughly the same width, in the door described in Claim 11.

14. A door such that said open part is a hole, in the door described in Claim 11.

15. A door such that said open part is a slot, in the door described in Claim 11.

16. A door such that said spline is metal, in the door described in Claim 11.

17. A door such that said lumber tie plates are adhered together, in the door described in Claim 11.

18. A door such that said spline is adhered inside said open part, in the door described in Claim 11.

19. A door such that a wooden plug is placed in each end of said open part and said metal spline is hidden by them, in the door described in Claim 16.

20. A door such that a first open part near one end of said lumber tie plate and a second open part near the opposite end of said lumber tie plate are furnished, in the door described in Claim 1.

21. A door such that

a. it includes multiple lumber tie plates that are adhered together side-by-side, that are no more than 63.5 mm (2-1/2 inches) wide, and have roughly the same length and depth; the grain of adjacent lumber tie plates is arranged in opposite directions, and in said lumber tie plates, there is a first matching slot that extends across it at one end and a second matching slot that extends across it at the opposite end of said lumber piece,

b. and that includes a wooden spline placed in each of said slots.

22. As the door, a door

a. that includes multiple lumber tie plates that are adhered together side-by-side, that are no more than 63.5 mm (2-1/2 inches) wide, and have roughly the same length and depth; the grain of adjacent lumber tie plates is arranged in opposite directions, and in said lumber tie plates, there is a first matching hole that extends across it near one end and a second matching hole that extends across it near the opposite end of said lumber tie plate.

b. and it includes a metal spline placed in each of said holes.

c. and a wooden plug that is placed in each end of said holes and that hides said metal spline with that.

23. A door, /3

a. that includes multiple lumber tie plates that are adhered together side-by-side, that are no more than 63.5 mm (2-1/2 inches) wide, and have roughly the same length and depth; the grain of adjacent lumber tie plates is arranged in opposite directions, and in said lumber tie plates, there is a first matching hole that extends across it near one end and a second matching hole that extends across it near the opposite end of said lumber tie plate,

b. and that includes a metal spline placed in each of said holes,

c. and said additional lumber tie plate adhered to the side edge that includes said hole, said metal spline is accepted matched with the end of said hole and is hidden by said additional lumber tie plate has a stop hold.

24. A door construction method

a. that includes a step for adhering multiple lumber tie plates, each of which has a width of no more than 63.5 mm (2-1/2 inches) and roughly the same length, together side-by-side, with the grain of adjacent lumber tie plates arranged in opposite directions,

b. and that includes a step for forming at least two slots – a first slot in one end of said lumber tie plate and a second slot in the opposite end of said lumber tie plate – across said lumber tie plate,

c. and a step for inserting a metal spline into each of said slots.

25. A door construction method

a. that includes a step for adhering multiple lumber tie plates, each of which is no more than 63.5 mm (2-1/2 inches) wide and roughly the same length, together side-by-side, with the grain of adjacent lumber tie plates arranged in opposite directions,

b. that includes a step for forming at least two holes – a first hole near one end of said lumber tie plate and a second hole near the opposite end of said lumber tie plate – across said lumber tie plate,

c. a step for inserting a metal spline into each of said holes,

d. and a step for inserting a wooden plug into each end of said holes and hiding said metal spline with them.

26. A door construction method,

a. that includes a step for adhering multiple lumber tie plates, each of which is no more than 63.5 mm (2-1/2 inches) wide and roughly the same length, together side-by-side, with the grain of adjacent lumber tie plates arranged in opposite directions,

b. and that includes a process for forming at least two holes – a first hole near one end of said lumber tie plate and a second hole near the opposite end of said lumber tie plate, across said lumber tie plate,

c. a process for inserting a metal spline into each of said holes,

d. and a process for adhering an additional lumber tie plate of the same depth, width and length and that has a stop hole for accepting said metal spline at each end of said holes and hiding said metal spline with that.

27. For the door construction method described in Claim 22, 23 or 24,

a construction method that includes: e. a step for polishing one side of said lumber tie plate to a finished state and producing a semi-finished door product by that,

f. a step for attaching a template that has a guide groove to the opposite side of said semi-finished door product from said finished side,

g. a process for placing said semi-finished door product on a router that has a table and a cutter so that a guide pin that projects upward from the table of said router locks into said guide groove of said template,

h. and a step for moving said semi-finished door product so that said guide pin will stay in said guide groove, and because of this, said pattern delineated by said guide groove of said template will be reproduced on said semi-finished door product by said cutter of said router.

Detailed explanation of the invention

Industrial application field

The present invention relates to a door construction method, such as for a cupboard door. /4

Prior art

With cupboard doors made from a single piece of lumber, warping in both length and width directions is unavoidable. To overcome this problem, a construction method for cupboard doors using five pieces of lumber has been developed by the industry, and four pieces of lumber are used to form a rectangular frame. The lumber pieces must be finished with a router prior to assembly in order to form a pattern that is visible when the lumber is assembled. Once the frame is formed, yet another lumber piece is inserted into the frame to serve as the center panel. However, there are many disadvantages to this type of construction and there are adverse effects on the aesthetic appearance of the cupboard door.

Problems to be solved by the invention

One general form of aesthetic shortcoming relates to the bonding of the frame component elements. Four bond locations must be cut out to form one frame. The cutting of these bond

locations requires a large amount of effort, and no small number of parts of all the bond locations are cut with gaps remaining, regardless of the skill of the worker. Even when the bond locations are cut as accurately as humanly possible, there is the possibility of still encountering gaps at a later time due to contraction of the lumber. With contraction, or as the lumber dries, [gaps] are also present in the center panel, which has a tendency to become loose and unsteady.

Another general form of aesthetic shortcoming relates to finishing of the lumber surface. The grain of the four pieces of lumber that form the frame inevitably passes longitudinally relative to the longitudinal axis of the side pieces and laterally relative to the longitudinal axis of the end pieces of the door, making it difficult to avoid polishing across the grain, which unfavorably affects finishing. Even when care is taken to coordinate the lumber when the frame is constructed, it is very difficult to obtain the appropriate grain and color that coordinate with the center panel.

The final form of aesthetic shortcoming relates to the decorative pattern traditionally placed on the cupboard door. The frame and center panel must be routed separately, and this limits the selection of patterns useful for the consumer. Obtaining a pattern on the frame that can be extended attractively to the center panel, while not impossible, is difficult.

Means to solve the problems

One major objective of the present invention is to provide a door construction method that maintains high resistance to warping and, on top of that, produces a finished product on which various unrestricted patterns can be routed as a result.

With the present invention, a construction method is obtained that includes first a step for adhering multiple lumber tie plates of roughly the same length together side-by-side where the grain of adjacent lumber pieces is arranged in opposite directions, that secondly includes a step for forming at least one open part that passes across the lumber pieces, and thirdly that includes a step for inserting a spline into the open part, for a door construction method.

Another major objective of the present invention is to provide a door that will maintain high resistance to warping and, on top of that, with which various unrestricted patterns can be routed.

With the present invention, a door board composed of multiple lumber tie plates that are bonded side-by-side to each other is obtained. The grain of adjacent lumber tie plates is arranged in opposite directions, the assembled lumber tie plates have at least one open part that extends across them, where a spline is placed.

Other characteristics of the present invention in addition to those above will become apparent from the following explanation that cites the attached figures.

Application example

A preferred embodiment of the present invention will be explained below related to Figures 1-8. Three door construction methods that can be implemented commercially will be explained. All three methods are interrelated, but slight differences have been developed to satisfy certain specific requirements. The methods to be explained were initially developed with a cupboard door in mind, but the methods can be used to produce doors of different types, so the present invention has even broader application. Regardless of the construction method, the entire door is indicated with reference numeral (10). /5

A first method of the door construction methods is shown in Figure 1. This exploded oblique view shows all the component elements of door (10) assembled according to the following steps. First, multiple lumber tie plates (12) are adhered together side-by-side. It is desirable that the lumber tie plates be no more than 63.5 mm (2-1/2 inches wide) and roughly the same length, if possible. It is important that the lumber tie plates be arranged so that the grain of adjacent lumber tie plates will run in opposite directions. The purpose of arranging the grain in opposite directions is so that door (10) will not warp longitudinally. In order to make this circumstance of the present invention more evident, it is conceivable that door (10) have a top part (14) and a bottom part (16). One of the lumber tie plates identified as (18) is adjacent to lumber tie plates (20) on both sides. When the grain of tie plate (18) runs longitudinally toward top part (14) of door (10), the grain of (20) must be arranged to run longitudinally toward bottom part (16). Lumber tie plate (18) has a natural tendency to warp, but this tendency is hindered by adjacent tie plates (20) that are arranged in the opposite direction and thus have a tendency to warp in the opposite direction.

It is desirable that the width of lumber tie plates (12) that constitute door (10) be kept to less than 63.5 mm (2-1/2 inches). The reason for this is that when width exceeds 63.5 mm (2-1/2 inches), there is the risk of the individual tie plates warping laterally.

Second, at least two slots (22) and (24), namely, first slot (22) for top part (14) in lumber tie plates (12) and second slot (24) for bottom end part (16) in lumber tie plates (12), are formed across lumber tie plates (12).

Third, a wooden spline (30) is adhered in each slot (22) and (24). Wooden spline (30) is useful for reinforcing door (10), and door (10) is prevented from warping laterally because of it.

A door (10) produced according to the first of the above-mentioned methods will be explained next.

Door (10) has multiple lumber tie plates (12) that are bonded together side-by-side, and that have a width of no more than 63.5 mm (1-1/2 inches) and roughly equal length and depth. The grain of adjacent lumber tie plates (12) is arranged to face in opposite directions. There is a first arranged slot (22) that extends across them at one end (14) and a second arranged slot (24) that

extends across them at the opposite end (16) in the assembled lumber tie plates (12). A wooden spline (30) is placed in each of aforementioned slots (22) and (24) and, preferably, adhered.

A second method of the door construction methods is shown in Figure 2. This method was developed when it was discovered that when wooden spline (30) used with the first method encounters contraction under certain environmental conditions and is put in place, the aesthetic appearance is therefore affected. What was specifically conceived was a situation in which the material is damp at the time of construction or that the humidity at the assembly location is high.

This second method is composed of the steps explained below. First, preferably, multiple lumber tie plates (12) no more than 63.5 mm (2-1/2 inches) wide and fourthly the same length are adhered together side-by-side.

First, as mentioned in the explanation of the first method, lumber tie plates (12) must be oriented so that the grain of adjacent lumber tie plates is arranged in opposite directions. Second, at least two holes (32) and (32), namely, first hole (32) near top end part (14) of lumber tie plates (12) and second hole (34) near bottom end part (126) of lumber tie plates (12) are formed across lumber tie plates (12). Third, a metal spline (36) is inserted into each hole (32) and (34). Metal spline (36) does not contract, and therefore greater reinforcement than that using wooden spline (30) is achieved. Metal spline (36) can be inserted at a fixed position most easily when it is round, but a metal spline that has a rectangular or triangular cross section can be used with the same results. A round metal spline is preferable for the simple reason that, in order to hold metal splines (36) together and accommodate them with boards, it is easier to produce a round hole than rectangular or triangular ones. Fourth, wooden plugs (38) are inserted into the end parts (40) of holes (32) and (32) and the ends of metal splines (36) are covered by them. Door (10) is more aesthetically pleasing if metal splines (36) are not visible. Wooden plugs (38) are inserted so that they are in the same plane as edge (26) or (28) of door (10). /6

Door (10) produced according t the second of the above-mentioned methods will be explained next.

Multiple lumber tie plates (12) no more than 63.5 mm (2-1/2 inches) wide and with roughly the same length and depth are adhered together side-by-side. Adjacent lumber tie plates (12) are arranged so that the grain of adjacent tie plates will run in opposite directions. Each lumber tie plate (12) has a first hole (32) that extends across it near one end (14) and a second hole (34) that extends across it at the opposite end (16). The holes in each tie plate are made so that the assembled door is provided with holes aligned extending across both the top part and bottom part. A metal spline (36) is placed in each hole (32) and (34). Wooden plugs (38) are placed in the ends (40) of holes (32) and (34), and metal spline (36) is hidden by them.

A third method of the construction methods for door (10) is shown in Figure 3. This method was developed to replace the production method using wooden plugs (38) which is

considered as encompassing a detailed operation requiring significant effort. This third method is composed of the steps that will be explained next. First, preferably, multiple lumber tie plates (12) no more than 63.5 mm (2-1/2 inches) wide and that have roughly the same length are adhered together side-by-side. As mentioned in the explanations of the first and second methods, lumber tie plates (12) must be assembled so that the grain of adjacent lumber tie plates (12) is arranged in opposite directions. Secondly, at least two holes (32) and (32), namely, first hole (32) near top end part (14) of lumber tie plates (12) and second hole (34) near bottom end part (16) of lumber tie plates (12) are formed across lumber tie plates (12). Third, a metal spline (36) is inserted into each hole (32) and (34). Fourth, an additional lumber tie plate (42) of the same width and length is adhered along edges (26) and (28) of door (10). There is a stop hole (44) in lumber tie rods (12). It accepts metal spline (36) matched with end parts (40) of holes (32) and (34), and it is hidden by them. In this construction method, metal splines (36) must be extended into stop holes (44) to provide the desired reinforcement.

A door (10) produced according to the third of the above-mentioned methods will be explained next. Door (10) has multiple lumber tie plates (12) that are adhered together side-by-side and, preferably, a width of no more than 63.5 mm (2-1/2 inches) and roughly the same length and depth. The lumber tie plates are assembled so that the grain of adjacent tie plate is arranged in opposite directions. Lumber tie plates (12) have a first hole (32) that extends across them near one end (14) and a second hole (34) that extends across them near the opposite end (16). The assembled lumber tie plates therefore produce a door that has aligned holes that extend across it near both the top part and the bottom part. A metal spline (36) is placed in each hole (32) and (34). There is a stop hole (44) in tie plate (42), along edges (26) and (28), that is matched with end parts (40) of holes (32) and (34) and that houses and hides metal spline (36).

The major commercial benefit provided by the above-mentioned methods is that taking into account the forming of patterns in door (10) is sufficiently realized for the first time. A method for forming patterns on door (10) is shown in Figures 4-8. For the purpose of explanation, a door that has not yet been patterned, but is provided with a finish and is polished, is called a "semi-finished door product." While semi-finished door products are mechanically complete doors, they have not been provided with a pattern that increases their aesthetic appeal, and thus their commercial value. To place a pattern on a door, the steps explained below are desirable. First, one side (46) of door (10) has a finish applied such as stain, paint or lacquer, it is then polished, and thus a semi-finished door product (48) is produced. It can be seen that when a door (10) is constructed using any one of the methods explained, the grain will all run longitudinally. The polishing process is simplified by the grain all running longitudinally and a finish will be possible that is far superior to what was provided previously using a door with a frame type explained as the

prior art background. Second, a template (50) that has guide groove (52) is attached to side (51) /7
of semi-finished door product (48) on the opposite side from polished side (46).

Template (50) can be produced in various unrestricted patterns. The pattern is delineated by guide groove (52) positioned on side (53) of template (50). The method of attaching semi-finished door product (48) to the template (50) is shown in Figures 4 and 5. Template (50) is produced to the same width and length as semi-finished door product (58). Multiple triangular projections (54) are attached to edge (56) of template (50) to prevent shifting between template (50) and semi-finished door product (48). Third, semi-finished door product (48) and template (50) are placed on router (58) so that guide pin (60) that projects upward from table (62) of router (58) locks into guide groove (50) of template (50). Fourth, guide pin (60) remains in guide groove (52), and because of this, semi-finished door product (48) is moved so that the pattern delineated by guide groove (52) of template (50) is reproduced on semi-finished door product (48) by cutter (64) of router (58).

Here, lumber tie plates of approximately equal length and width were mentioned, but it is understandable that lumber tie plates of unequal length and width may be expected. If the assembled cupboard door is rectangular or square as in regular applications, the lumber tie plates that constitute the cupboard will be equal length. Depending on the assembly technology in use, it should be understood that the tie plates are cut to equal length beforehand or they can be cut to a specific length after they are adhered together side-by-side. For more decorative applications, it is conceivable that assembled doors having outlines with a curved top and bottom, or diamond shaped, triangular or even more unusual shapes will be desirable. Clearly, in the case of this type of application, the lumber tie plates are not of equal length. In the same way, cases in which special patterns that can be accomplished by assembling lumber tie plates that have different thicknesses are also possible. In such cases, the tie plates are not of equal depth.

In addition, this disclosure is associated with the use of splines at both the top and bottom parts of the assembled door. However, it should be understood that producing a door such that only a single spline is used, and, for example, it is placed in the center between the top part and bottom part falls within the scope of the present invention. This type of structure can be used when the door is short or when a shape other than a rectangle is used.

The present invention was explained in detail associated with specific application examples, but it should be understood that other variations are possible that do not stray from the spirit and scope of the present invention.

Brief description of the figures

Figure 1 is an exploded oblique view of one form of preferred embodiment of the present invention. Figure 2 is an exploded oblique view of a second form of preferred embodiment of the

present invention. Figure 3 is an exploded oblique view of a third form of preferred embodiment of the present invention. Figure 4 is an oblique view of a preferred embodiment of the present invention and of a template. Figure 5 is an oblique view of a preferred embodiment of the present invention and a template on a router. Figure 6 is a cross section of a preferred embodiment of the present invention for cut line 6-6 in Figure 5. Figure 7 is a plan view of the front surface of a preferred embodiment of the present invention. Figure 8 is a plan view of the back side of a template used to produce a pattern for a preferred embodiment of the present invention.

(10):	Door	(51), (46):	Side
(12), (42):	Tie plate	(48):	Semi-finished door product
(22), (24):	Slot	(50):	Template
(26), (28):	Edge	(52):	Guide groove
(30):	Wooden spline	(58):	Router
(32), (34):	Hole	(60):	Guide pin
(36):	Metal spline	(62):	Table
(38):	Wooden plug	(64):	Cutter
(42):	Stop hole		

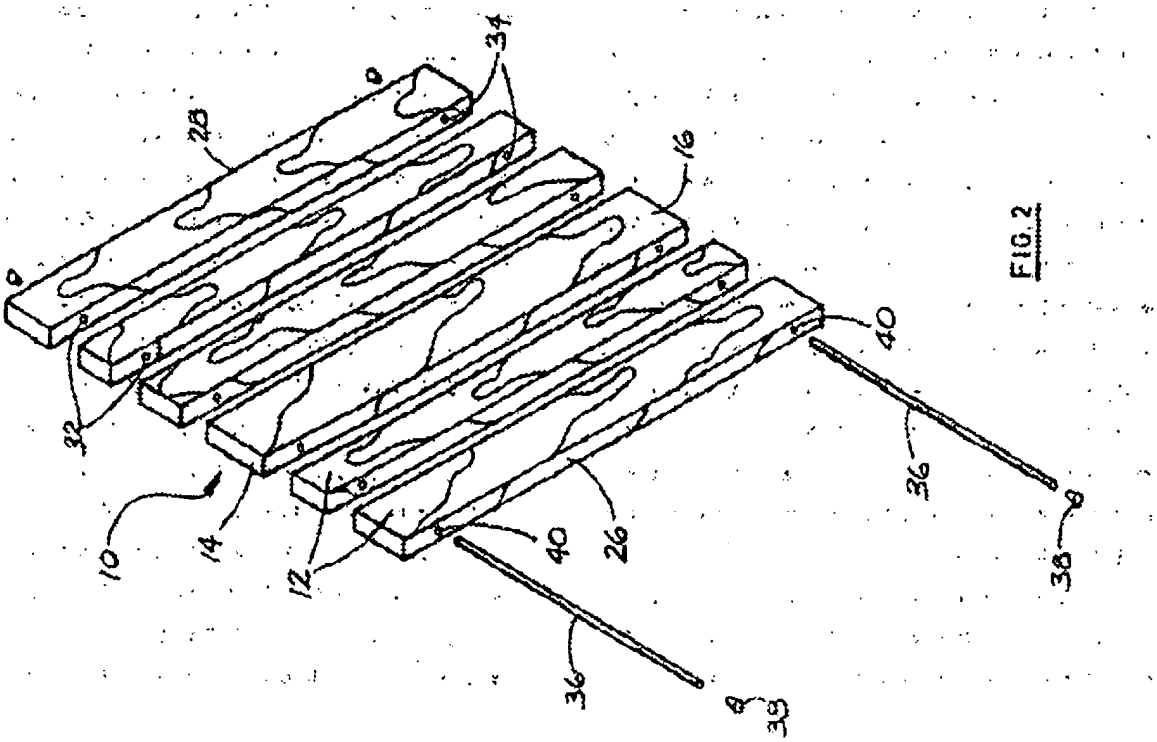

FIG. 2

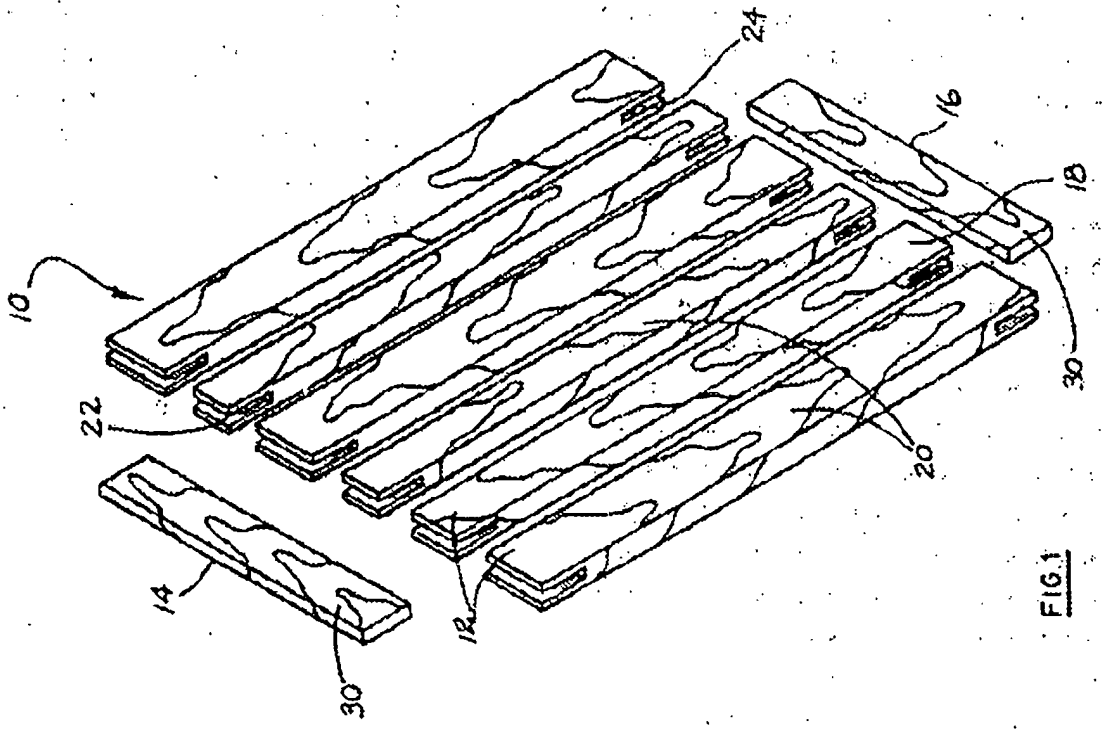

FIG. 1

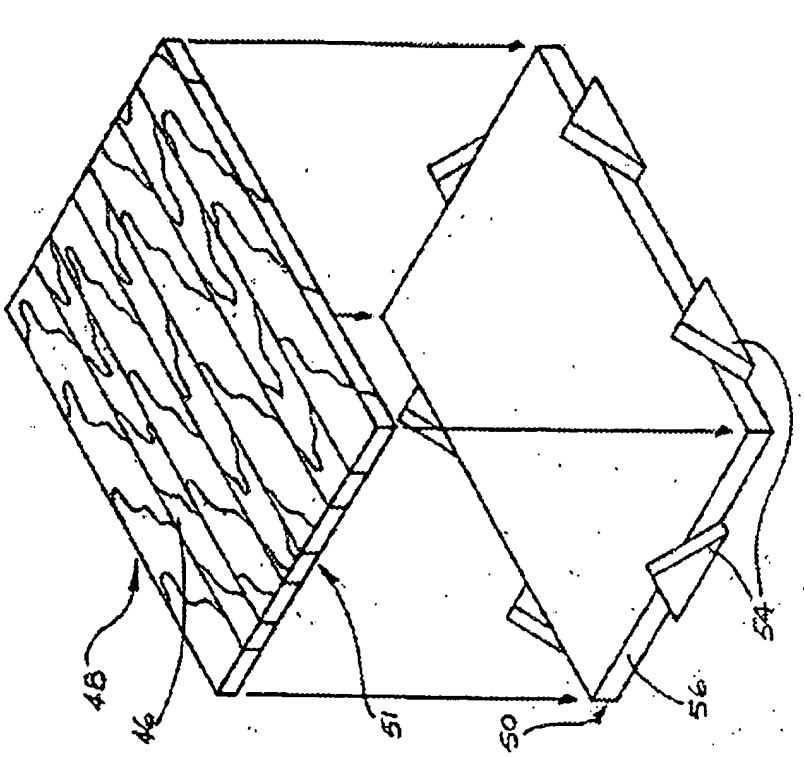

FIG. 4

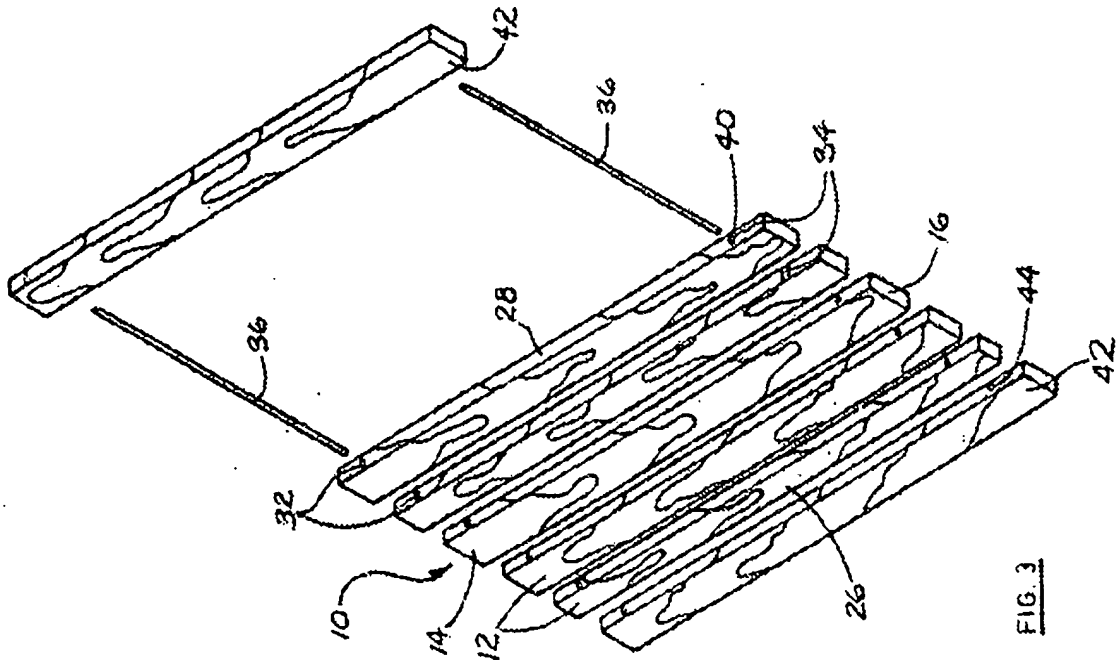

FIG. 3

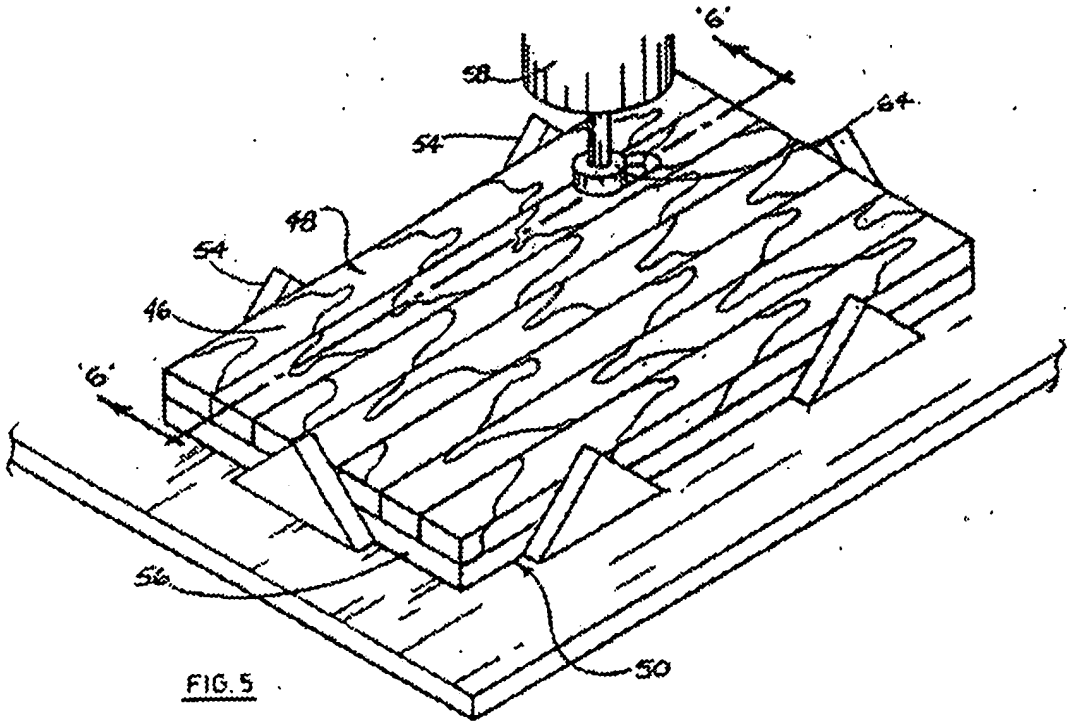

FIG. 5

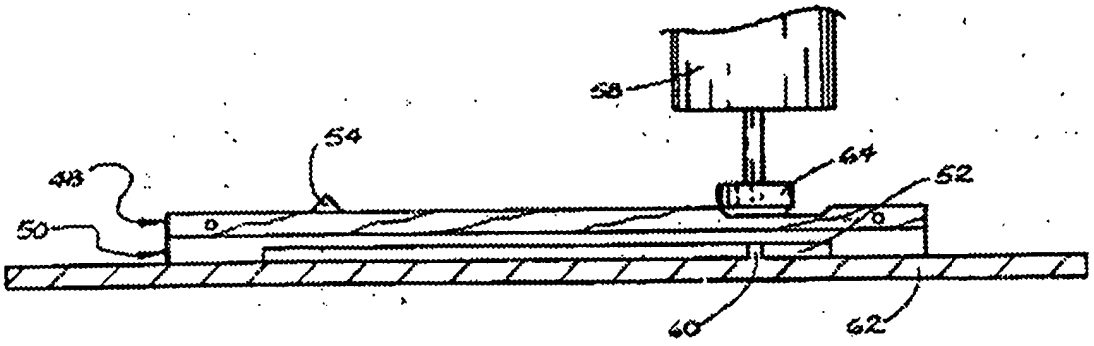

FIG. 6

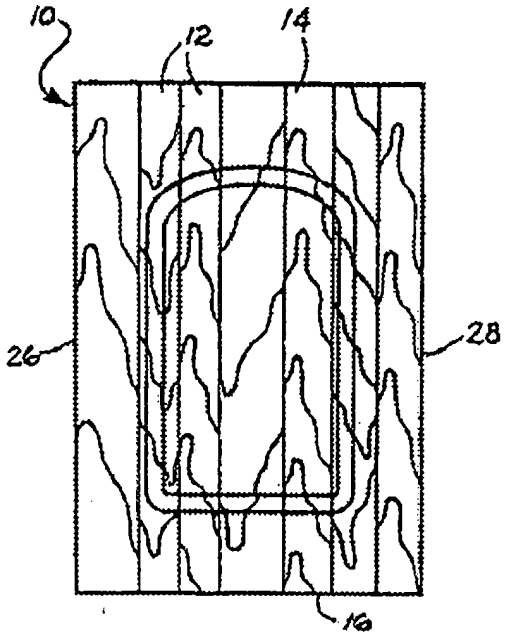

FIG.7

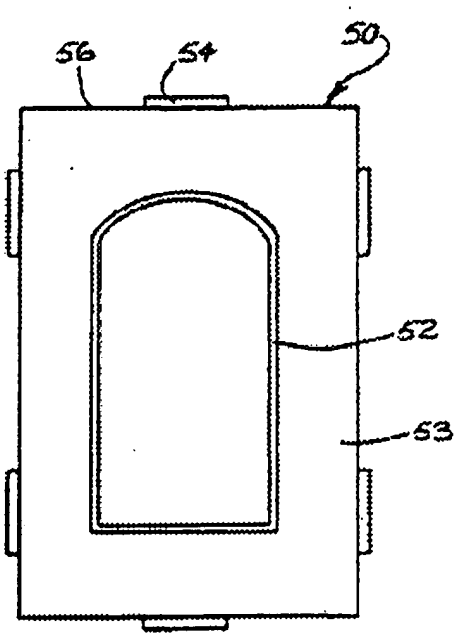

FIG.8